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TELEMETRY CHANNEL CALIBRATION CURVES FOR
PROJECT 1.3, OPERATION UPSHOT-KNOXVILLE
Nevada Proving Ground, March-May 1953

Bendix Aviation Corporation
Pacific Division

NORTH HOLLYWOOD, CALIF.

V-7370-19

12 August 1953

Security Information

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AFSWP-226

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TELEMETERING CHANNEL CALIBRATION CURVES FOR
PROJECT 1.3, OPERATION UPSHOT-KNOTHOLE
Nevada Proving Ground, March-May 1953

Contract No. AF 19(604)-605

PACIFIC DIVISION
Bendix Aviation Corporation
North Hollywood, California

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TELEMETERING CHANNEL CALIBRATION CURVES FOR
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Nevada Proving Ground, March-May 1953

A. Receiving Station Calibration

Calibration of the receiving stations was accomplished by applying a series of accurately known audio frequency signals into each sub-carrier discriminator and measuring the resultant recording galvanometer deflection produced by each frequency. Nine frequencies were applied to each discriminator. The frequency values used were such that they covered the range of the discriminators, e.g. $\pm 7\frac{1}{2}$ percent of center frequency of each sub-carrier channel. The approximate values of the calibration frequencies used for each of the three sub-carrier channels were as follows:

| <u>7.35 kc channel</u> | <u>10.5 kc channel</u> | <u>14.5 kc channel</u> |
|------------------------|------------------------|------------------------|
| 6800 cps | 9,700 ps | 13,400 |
| 6900 | 9,800 | 13,500 |
| 7000 | 10,000 | 13,900 |
| 7150 | 10,200 | 14,200 |
| 7350 | 10,500 | 14,500 |
| 7550 | 10,800 | 14,800 |
| 7700 | 11,000 | 15,100 |
| 7800 | 11,200 | 15,400 |
| 7900 | 11,300 | 15,600 |

A short recording was made on the oscillograph for each calibration frequency fed into the discriminators. Since the output of each discriminator was connected to a galvanometer in the oscillograph, every change in the frequency of the signal introduced to the discriminator resulted in a corresponding change in the deflection of that particular galvanometer trace on the recording paper. After these records were developed, the galvanometer deflection of each channel, as measured from a reference trace in the center of the recording paper, was measured and recorded for each input frequency to each discriminator. These values are recorded on the channel calibration curves included as Figures 1 to 111. Using these values, curves were plotted of galvanometer deflection in inches versus frequency and are shown on the enclosed pages.

B. Pickup Calibration

The pressure pickups used in the canisters were variable reluctance type instruments. The pickups consist of a metal housing comprised of two pressure chambers separated by a corrugated beryllium-copper diaphragm. Attached to the diaphragm and facing an inductor mounted in one end of the housing, is a disc of high permeability alloy. Pressure applied to either chamber causes a deflection of the diaphragm and thereby a change in the air gap of the magnetic

circuit. Used in conjunction with an inductance-controlled oscillator, the pickup is adjusted so that application of full range pressure produces the desired frequency change of the sub-carrier oscillator.

By applying accurately determined pressure values to each pickup, and recording the frequency of the sub-carrier oscillator connected to the pickup, a curve of frequency versus pickup function may be plotted from these values. These pickup calibration curves have been replotted on the enclosed channel calibration curves.

C. Data Reduction Procedure

By use of the aforementioned discriminator and pickup calibration curves, a correlation between pickup function values and galvanometer deflection values may be obtained. Since these two curves are both plotted on the same sheet and use the same frequency co-ordinates, galvanometer deflection can be directly converted to a value of the function being measured. Scales may then be made which can be calibrated in the terms of the function to be measured. By using a mark on the scale to correspond to the reference trace on the telemetered record, these data reduction scales may be used to read the pressure and thermal values direct from the record. An example of this can be found on the enclosed calibrations.

APPENDIX I
CALIBRATION DATA

Upshot No. 4

| <u>Figure</u> | <u>Title</u> |
|---------------|--|
| 1 - 14 | Channel Calibration, 7.35 kc - Array Positions 1 - 14 |
| 15 - 28 | Channel Calibration, 10.5 kc - Array Positions 1 - 14 |
| 29 - 42 | Channel Calibration, 14.5 kc - Array Positions 1 - 14 |
| 43 | Signal Strength Calibrations - Array Positions 1, 2, 3 and 4 |
| 44 | Signal Strength Calibrations - Array Positions 5, 6, 12 and 13 |
| 45 | Signal Strength Calibrations - Array Positions 14 and 7 |
| 46 | Signal Strength Calibrations - Array Positions 8, 9, 10 and 11 |

Knothole No. 1

| | |
|----------|---|
| 47 - 66 | Channel Calibration, 7.35 kc - Array Positions 1 - 20 |
| 67 - 86 | Channel Calibration, 10.5 kc - Array Positions 1 - 20 |
| 87 - 106 | Channel Calibration, 14.5 kc - Array Positions 1 - 20 |
| 107 | Signal Strength Calibrations - Array Positions 1, 2, 3 and 4 |
| 108 | Signal Strength Calibrations - Array Positions 5, 6, 7 and 8 |
| 109 | Signal Strength Calibrations - Array Positions 9, 10, 19 and 20 |
| 110 | Signal Strength Calibrations - Array Positions 11, 12, 13 and 14 |
| 111 | Signal Strength Calibrations - Array Positions 15, 16, 17 and 18 |

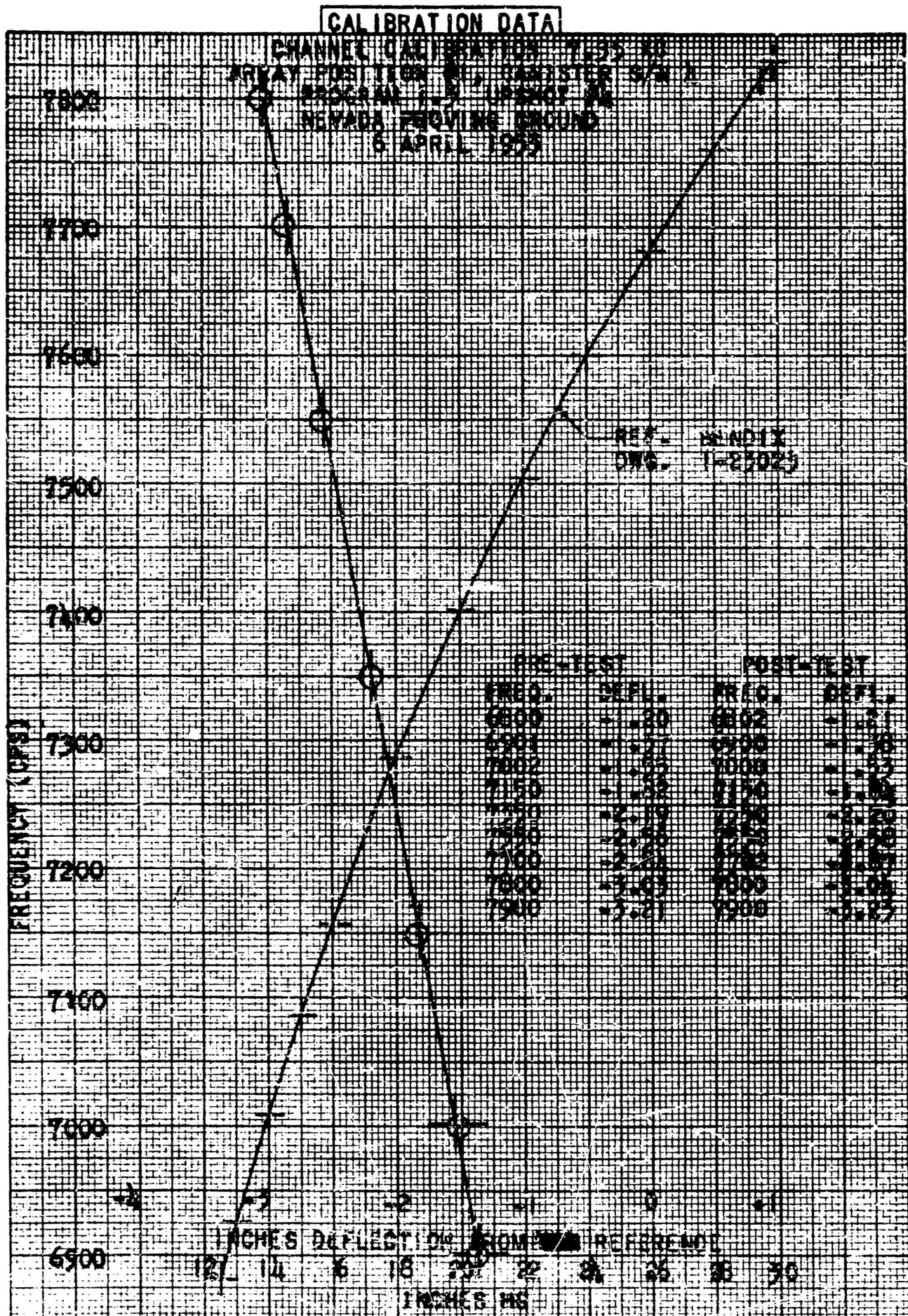


Figure 1

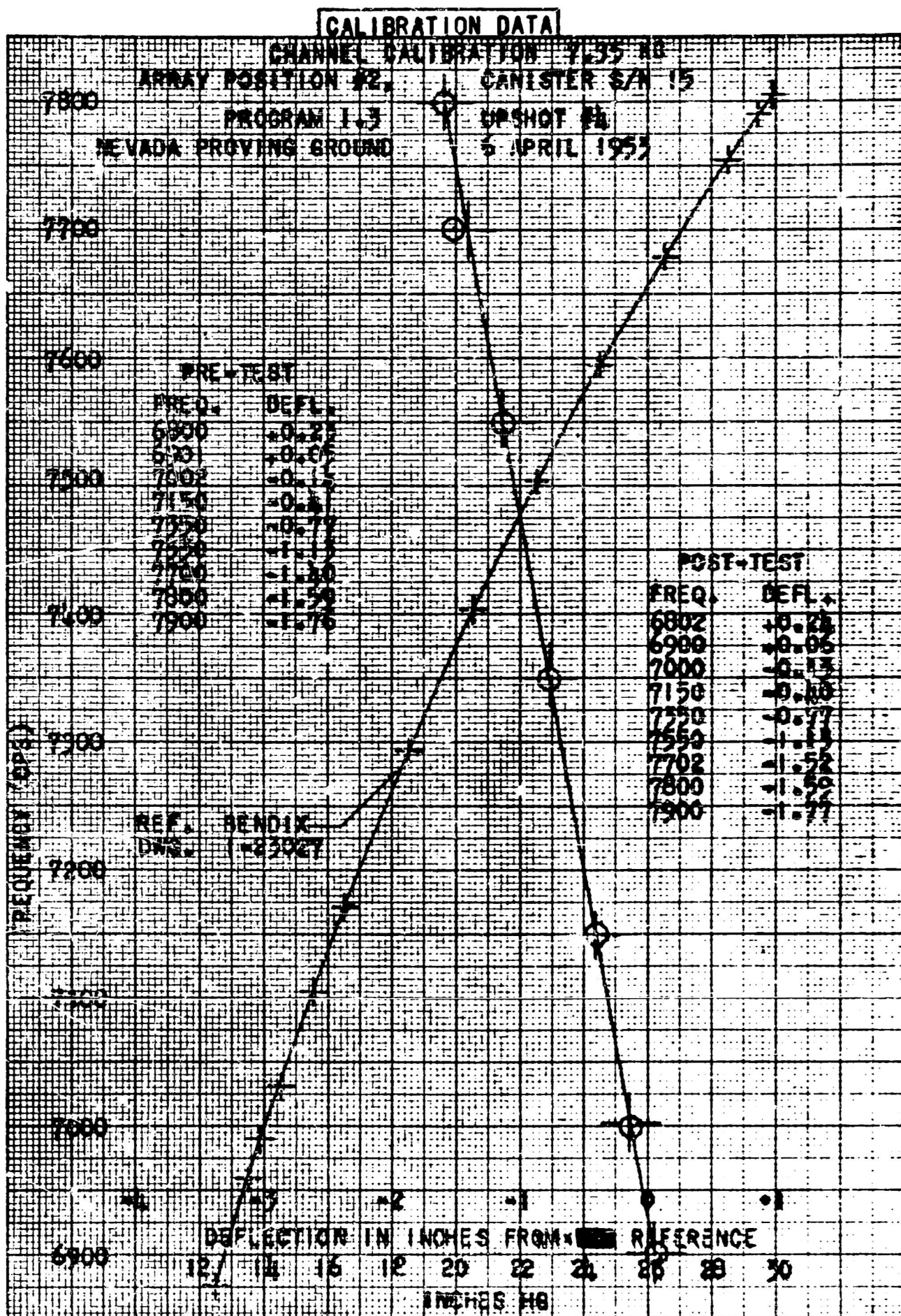


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CALIBRATION DATA

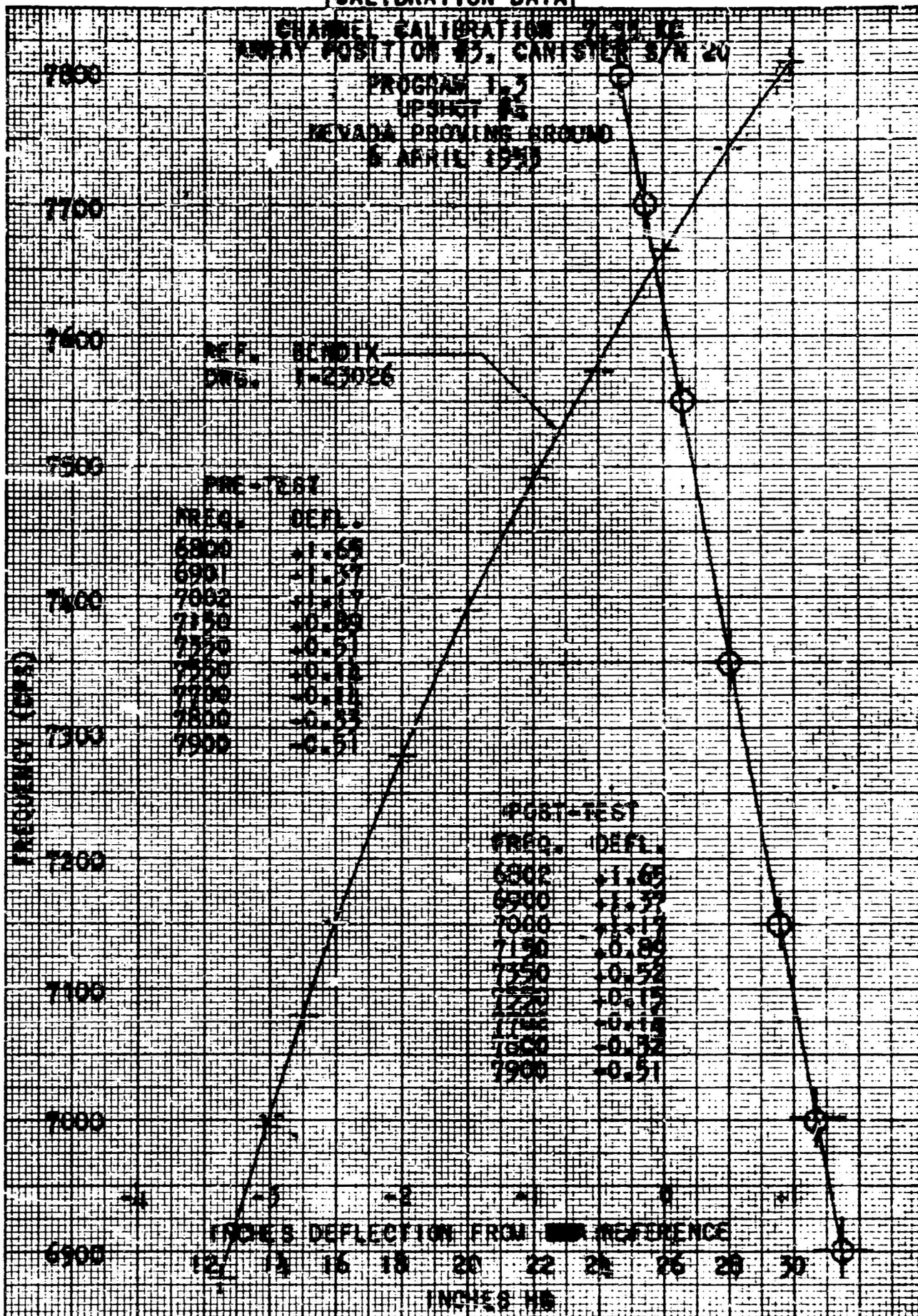


Figure 3

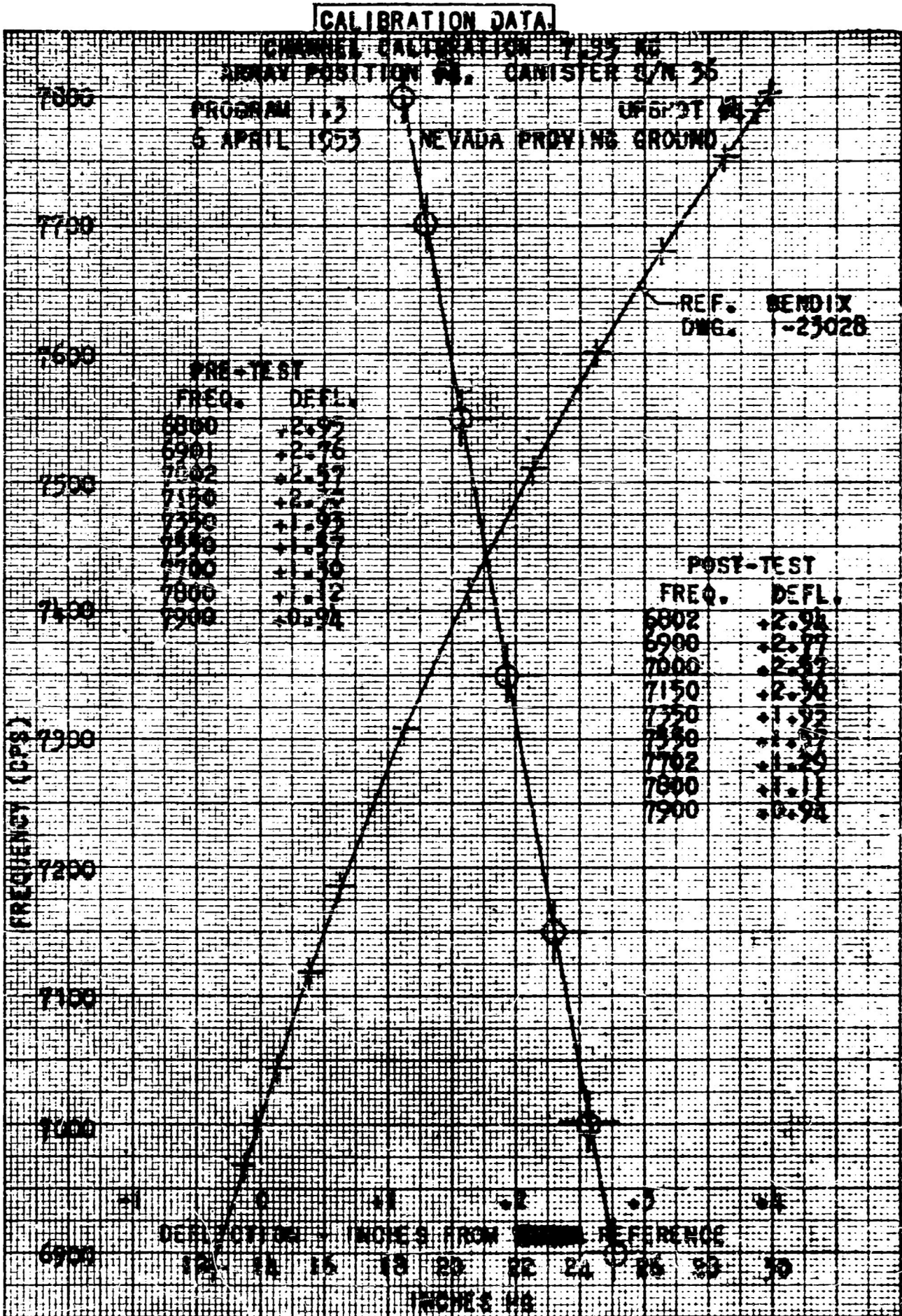


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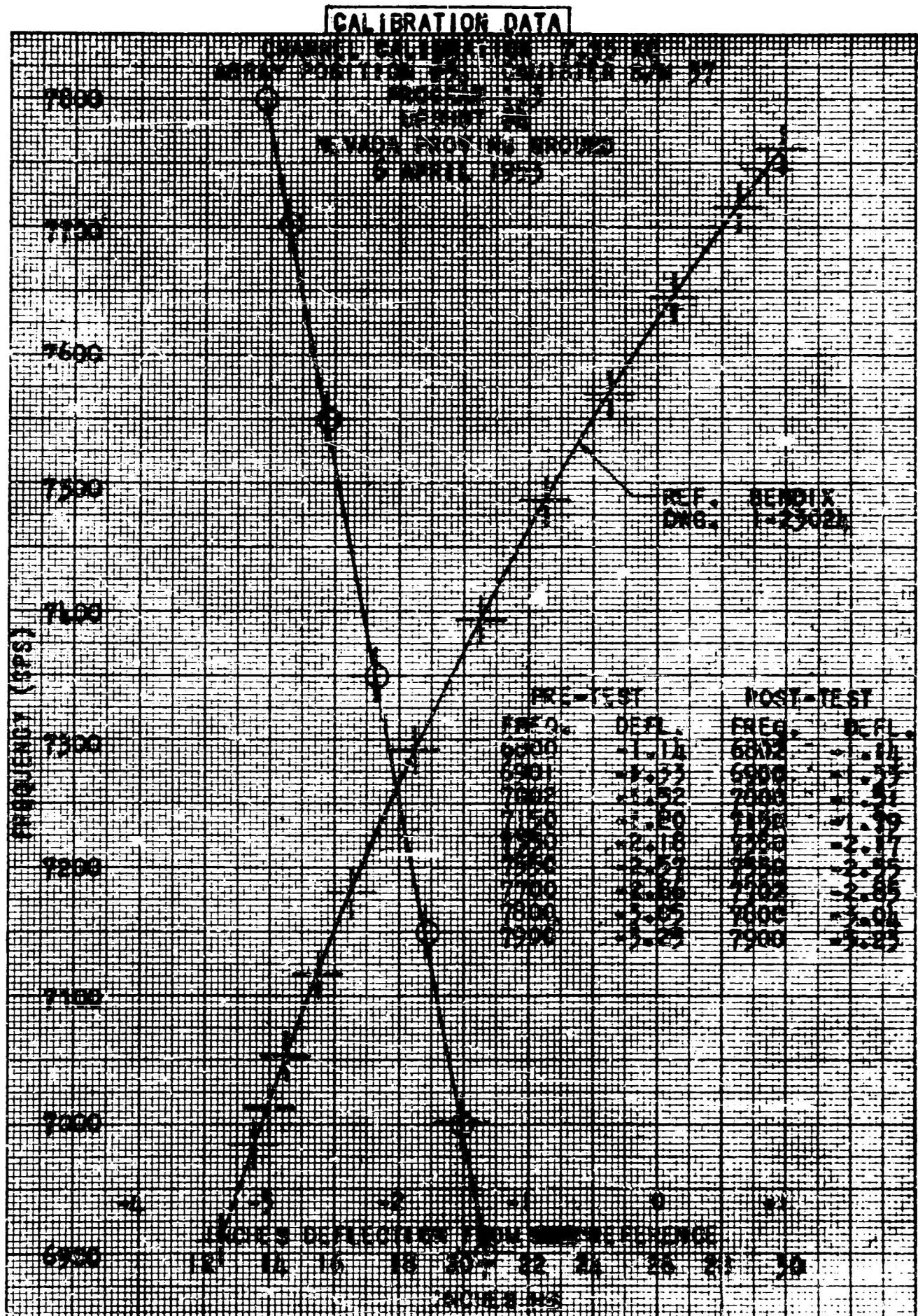


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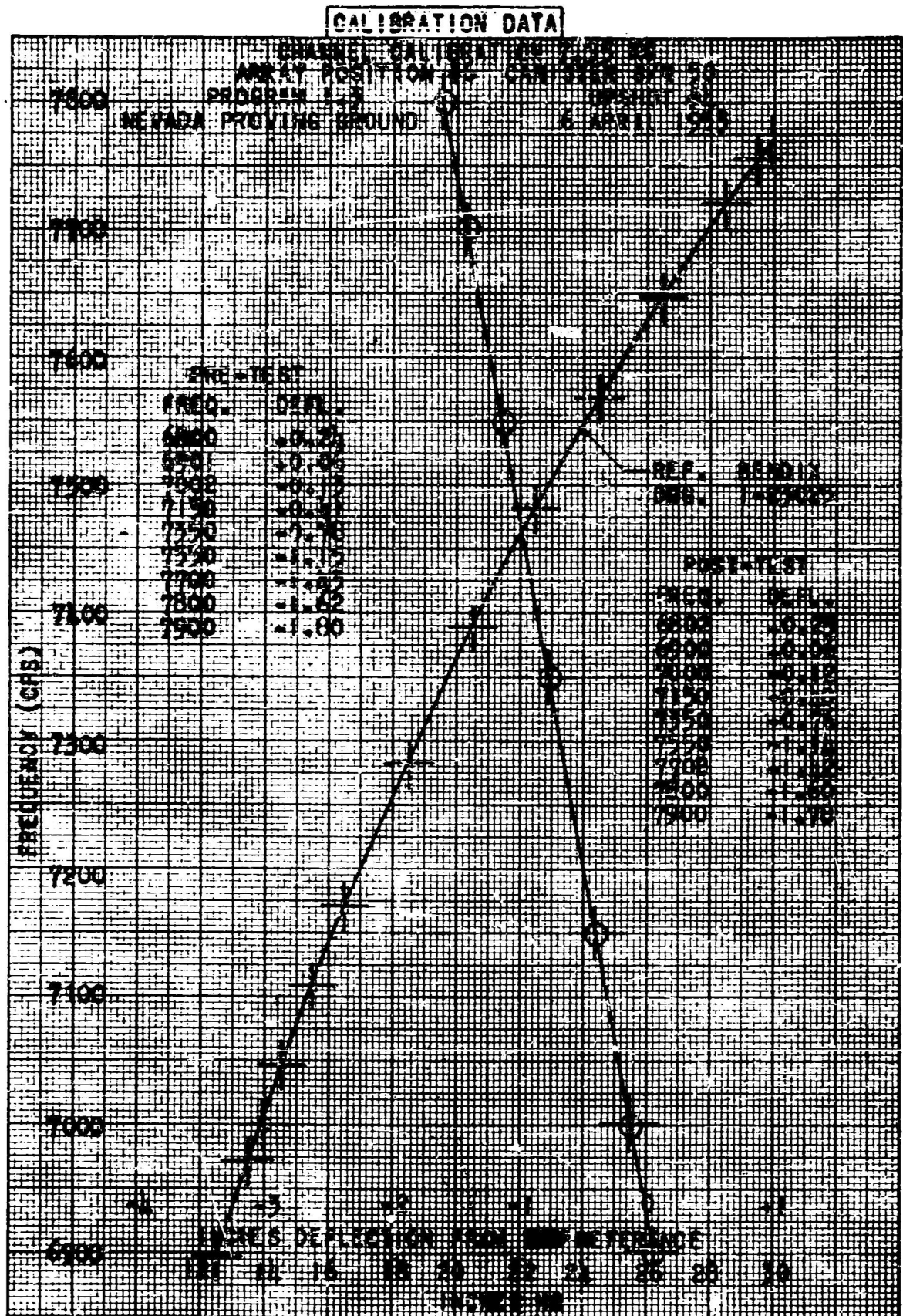


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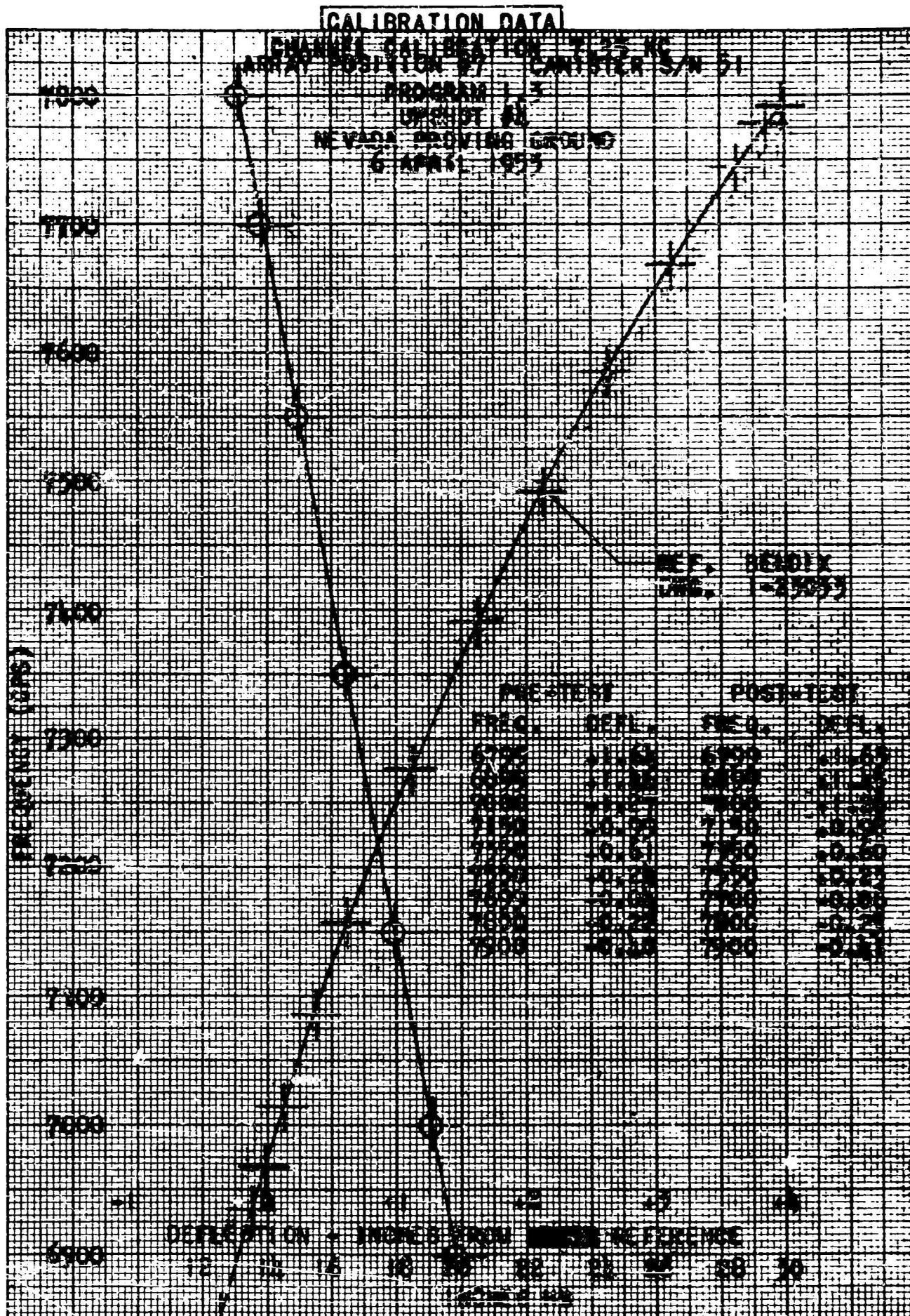


Figure 7

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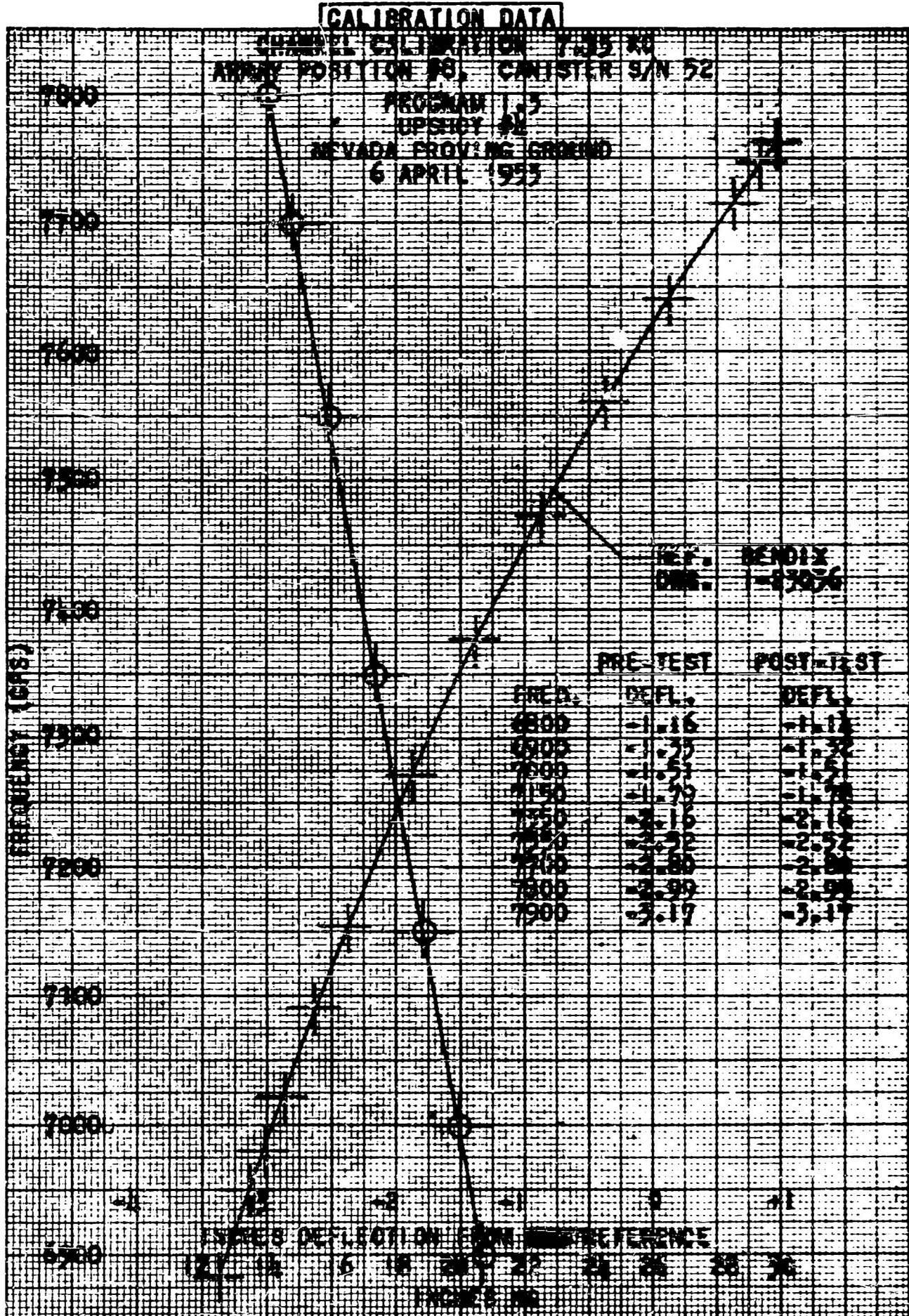


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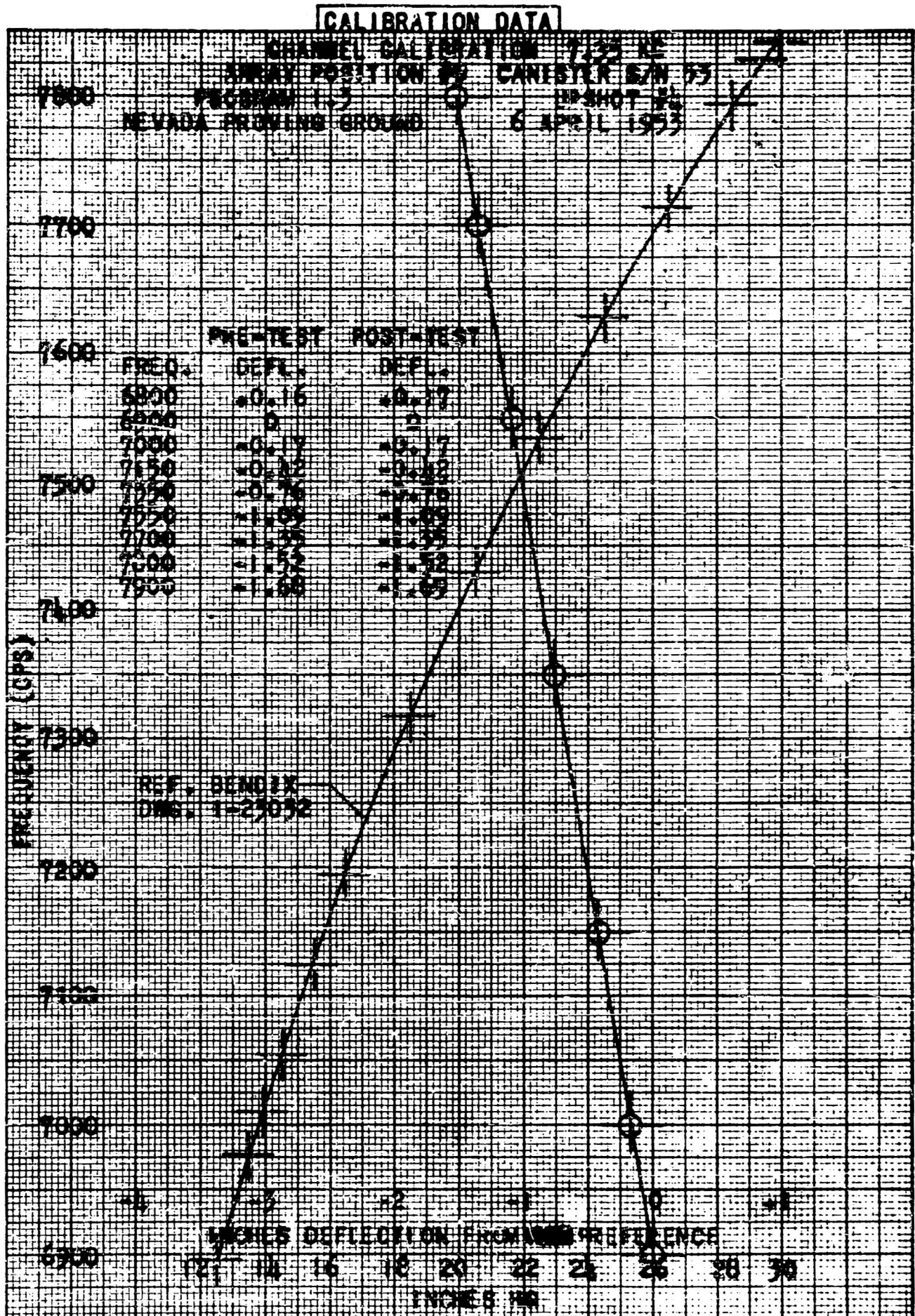


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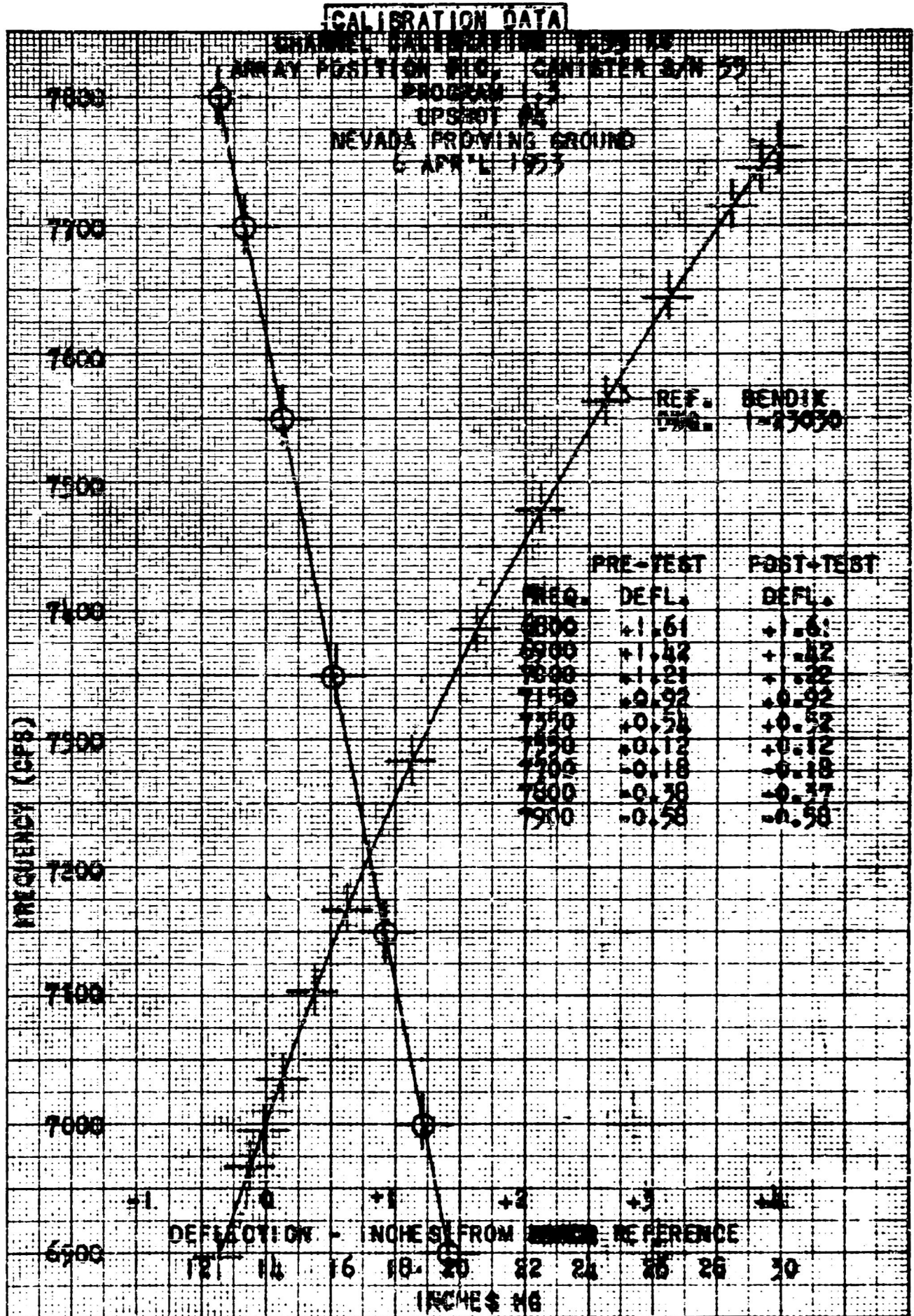


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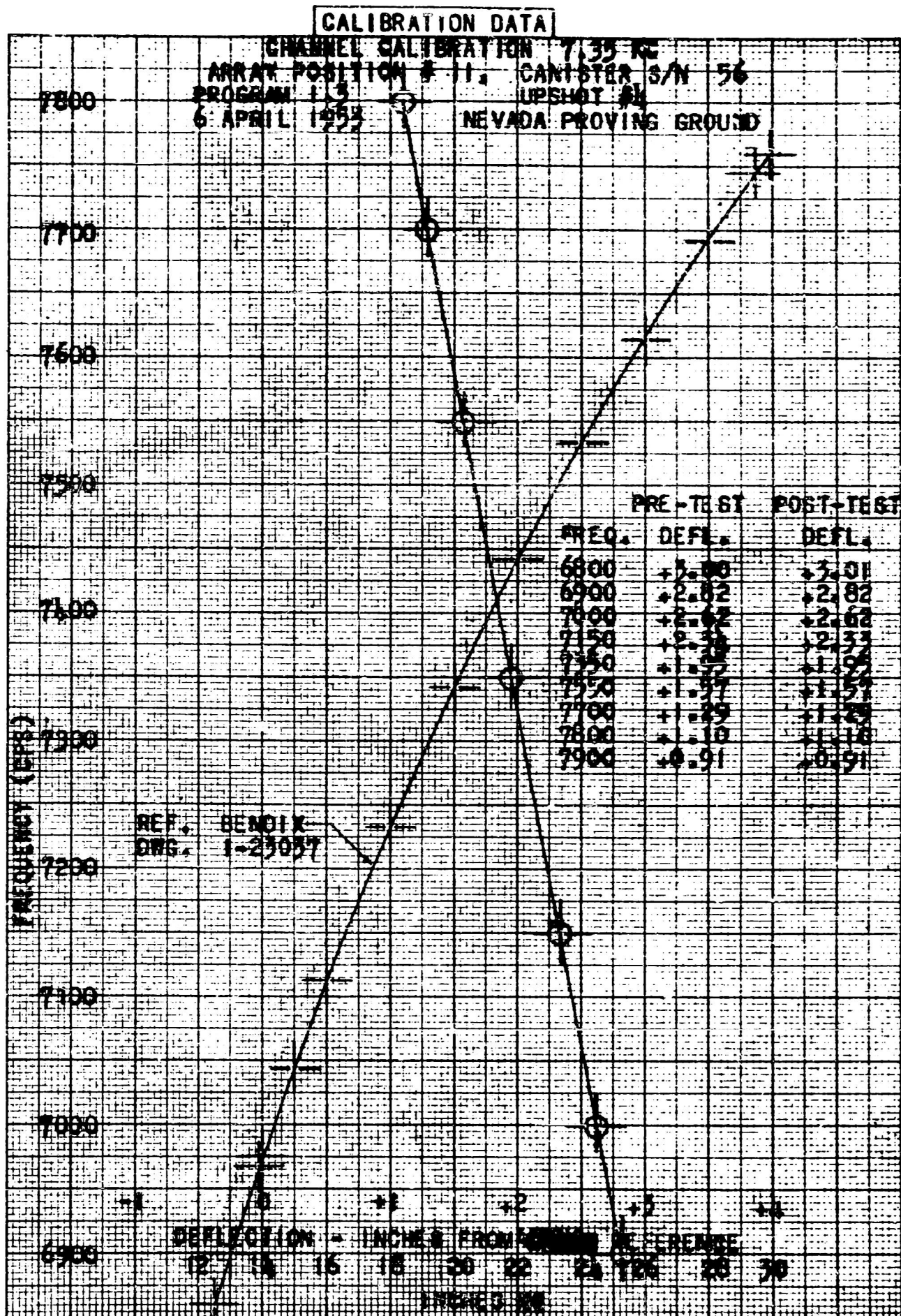


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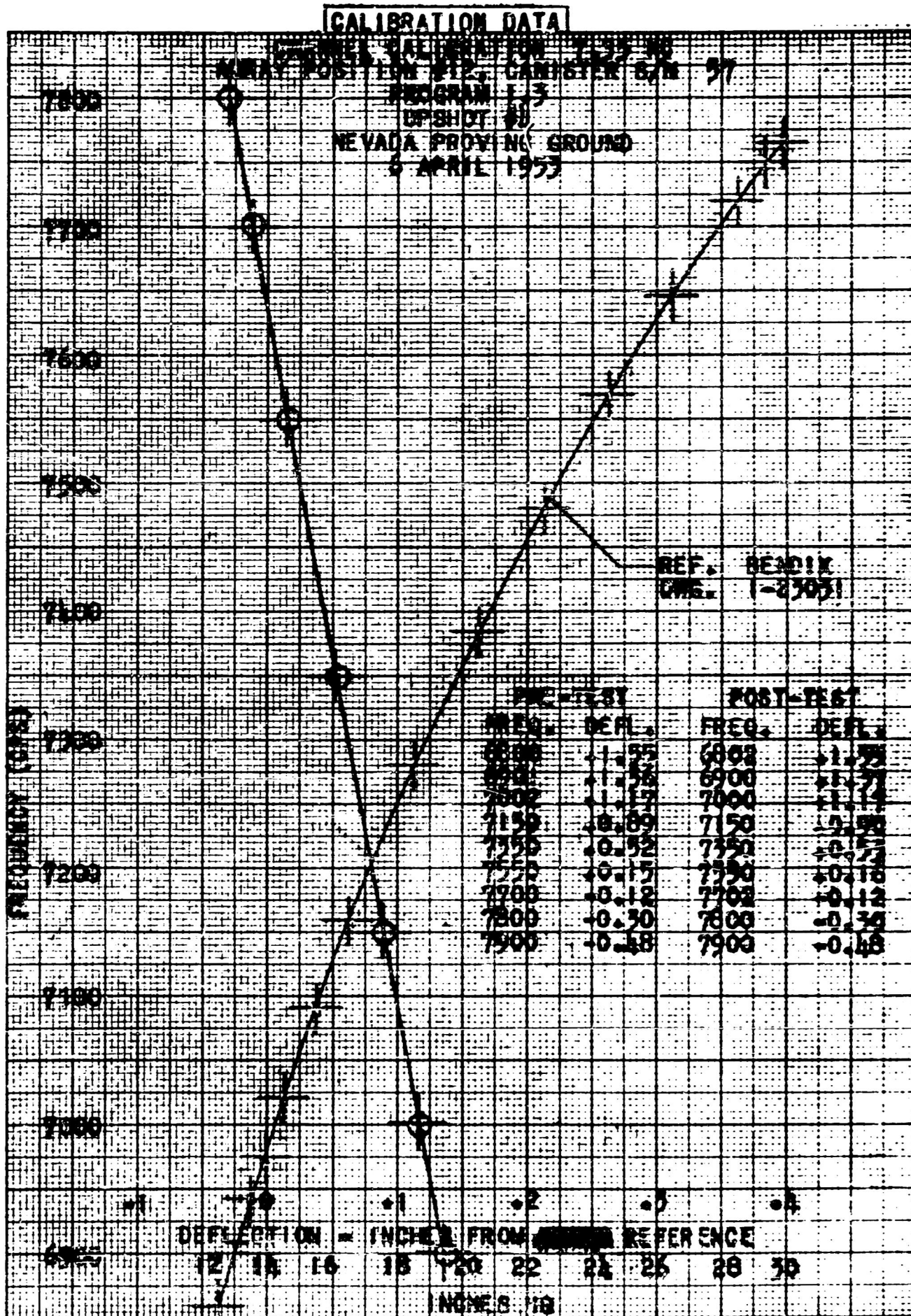


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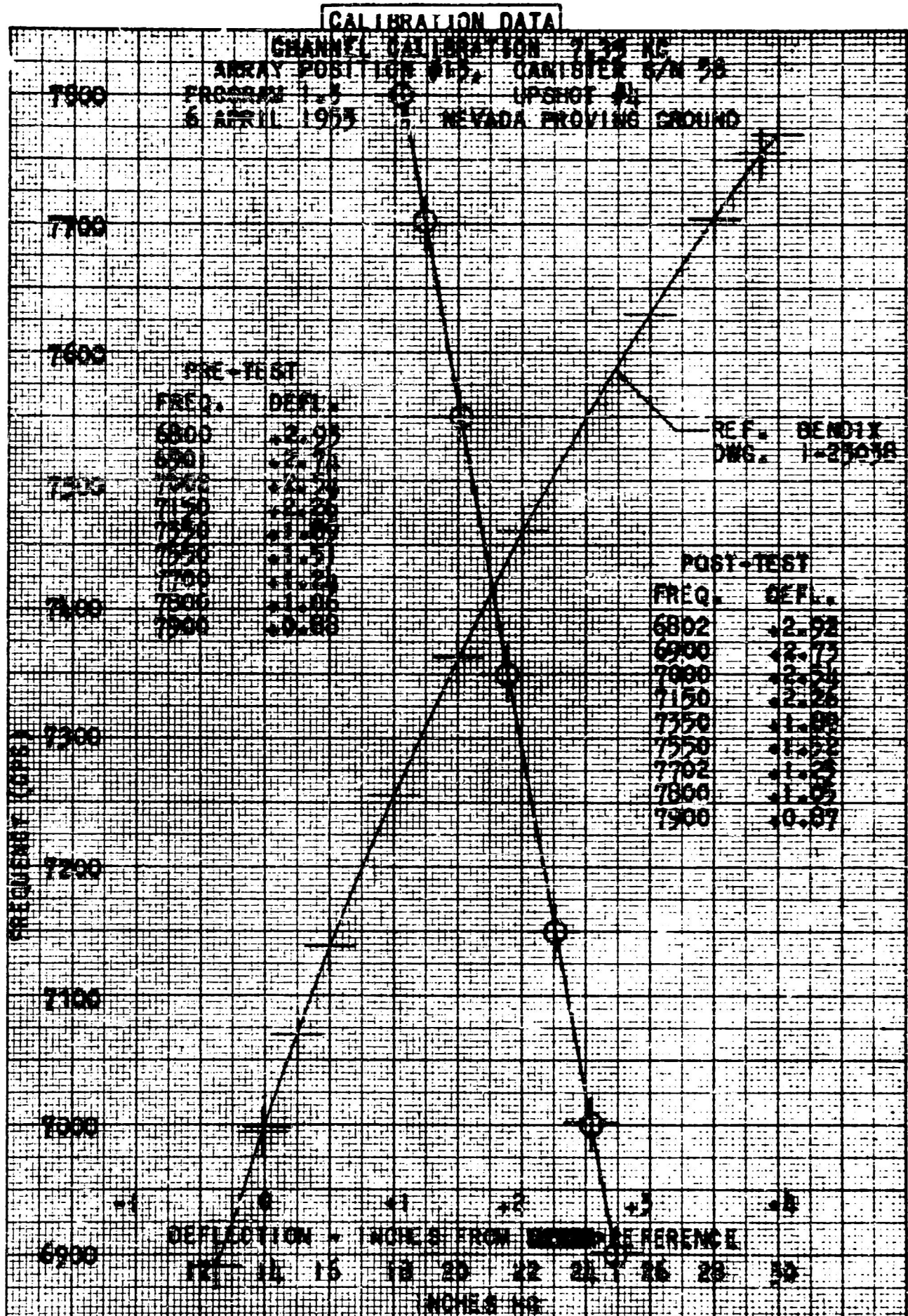


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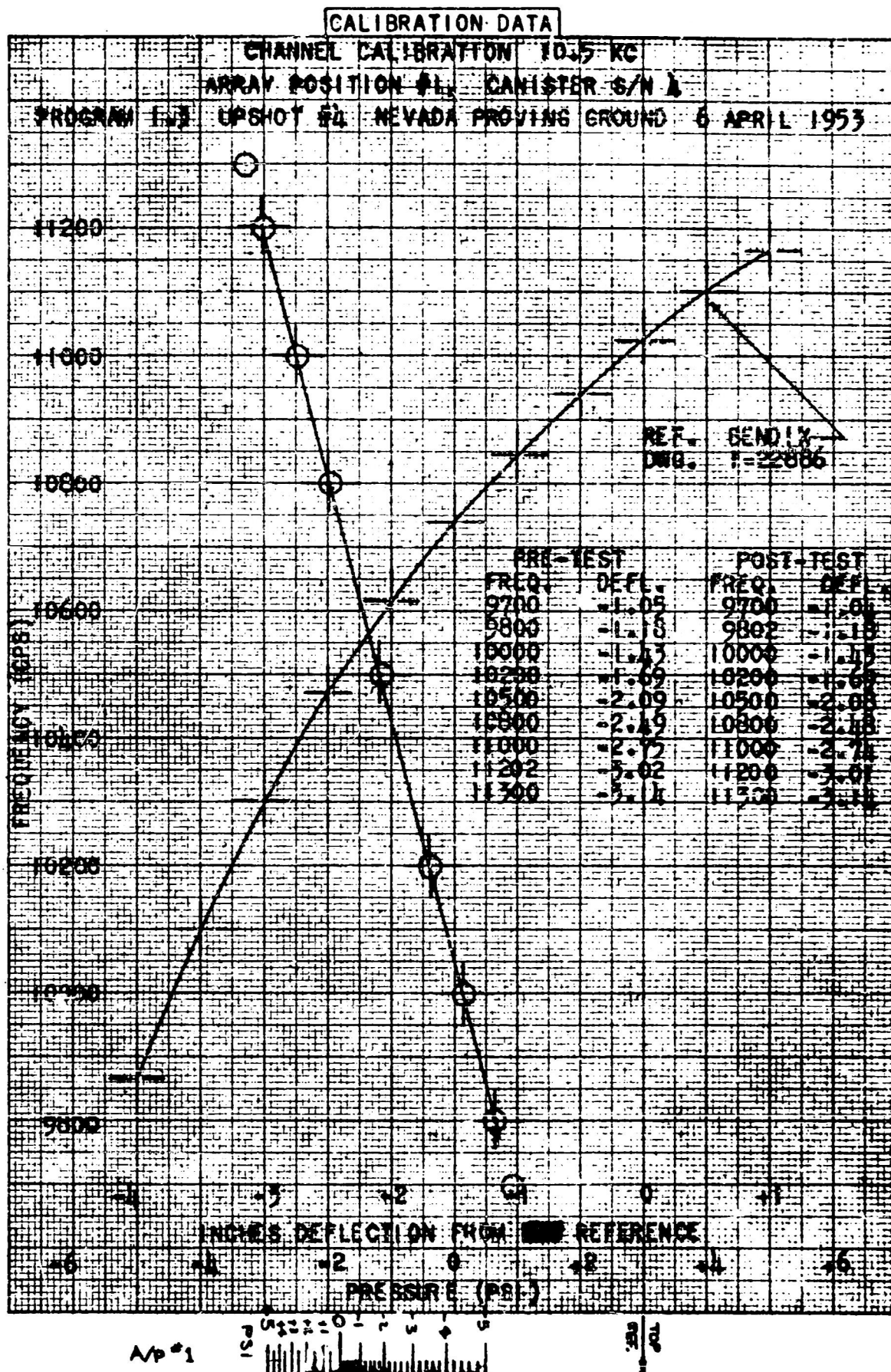


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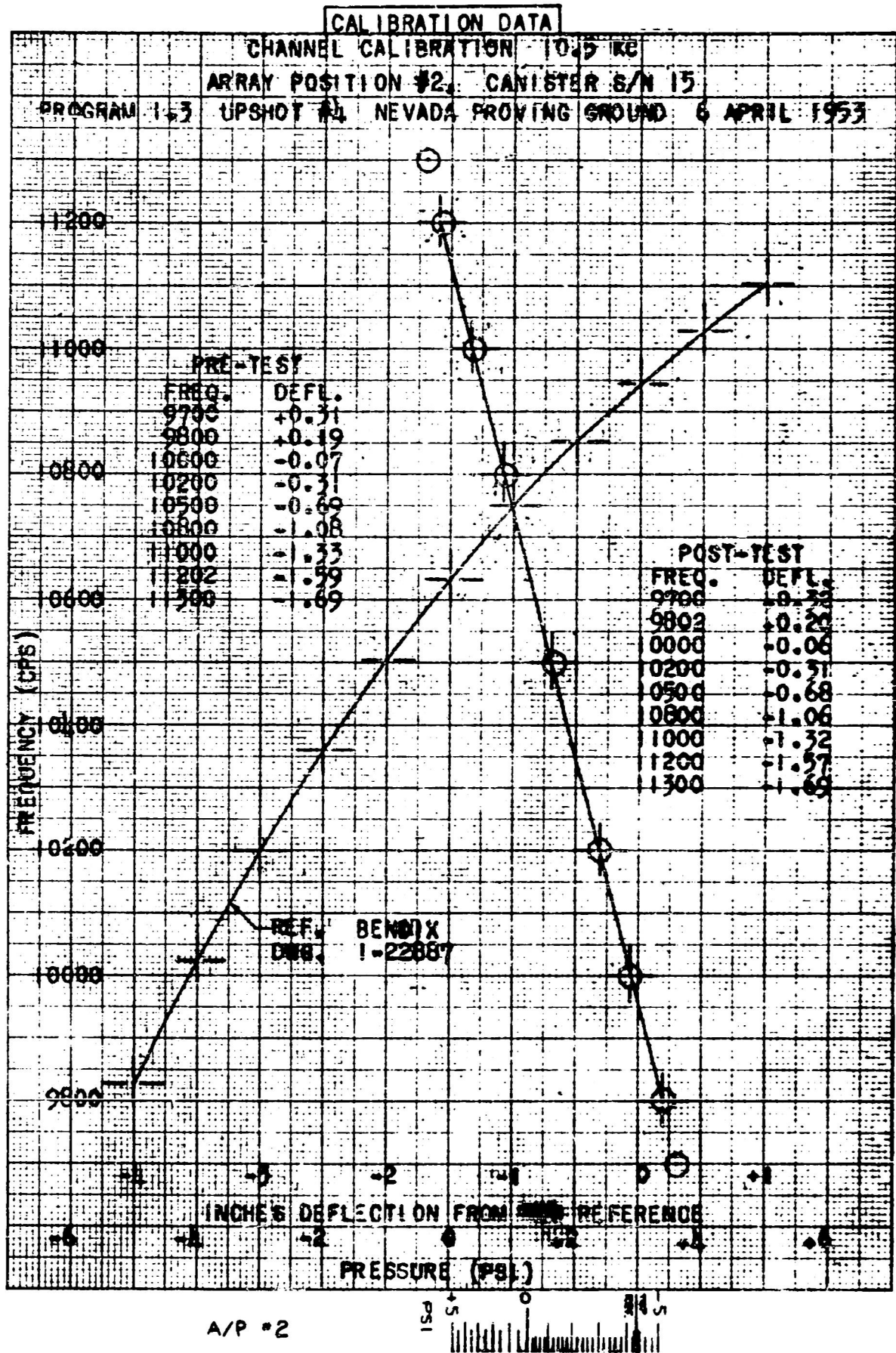


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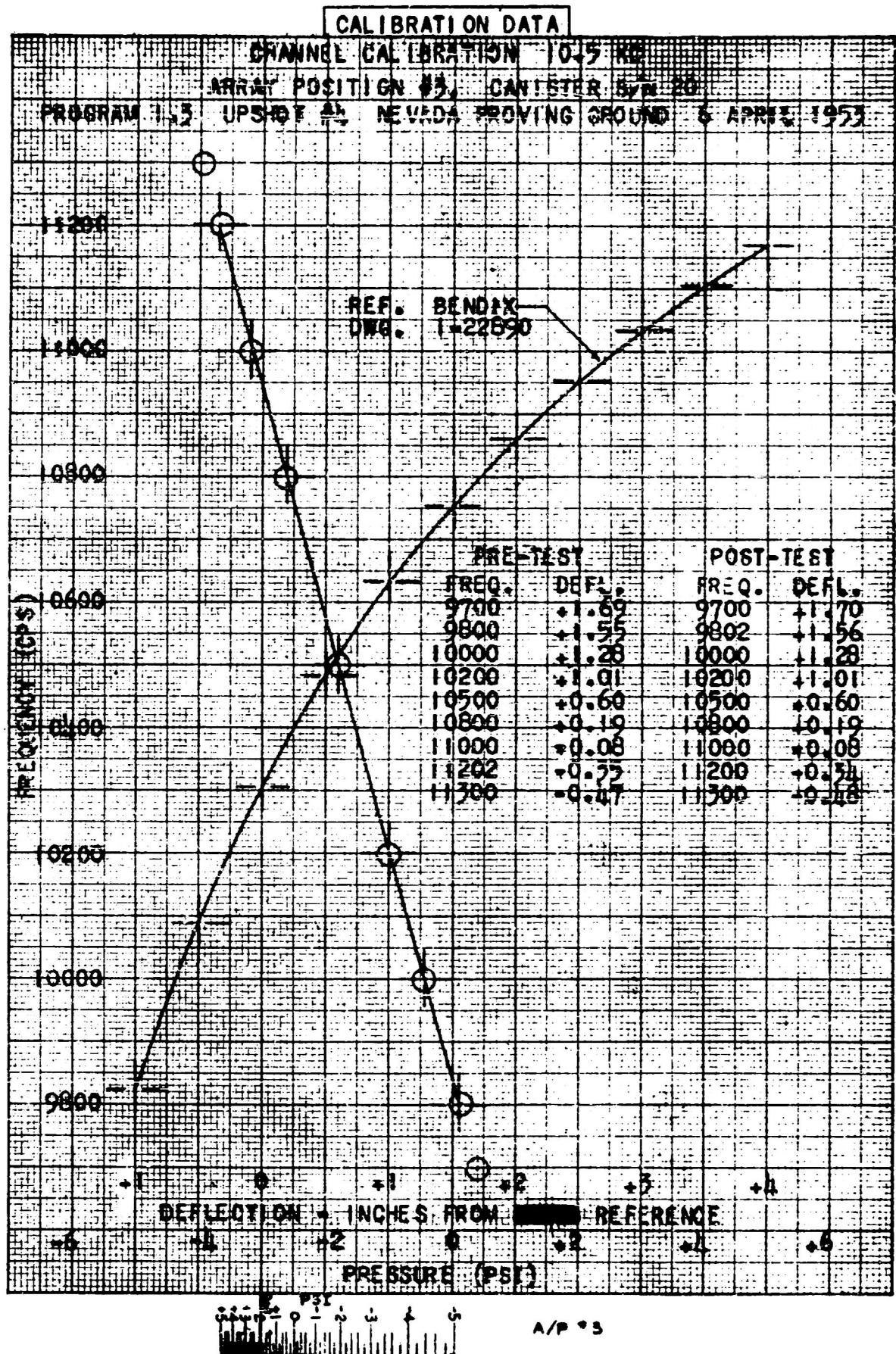


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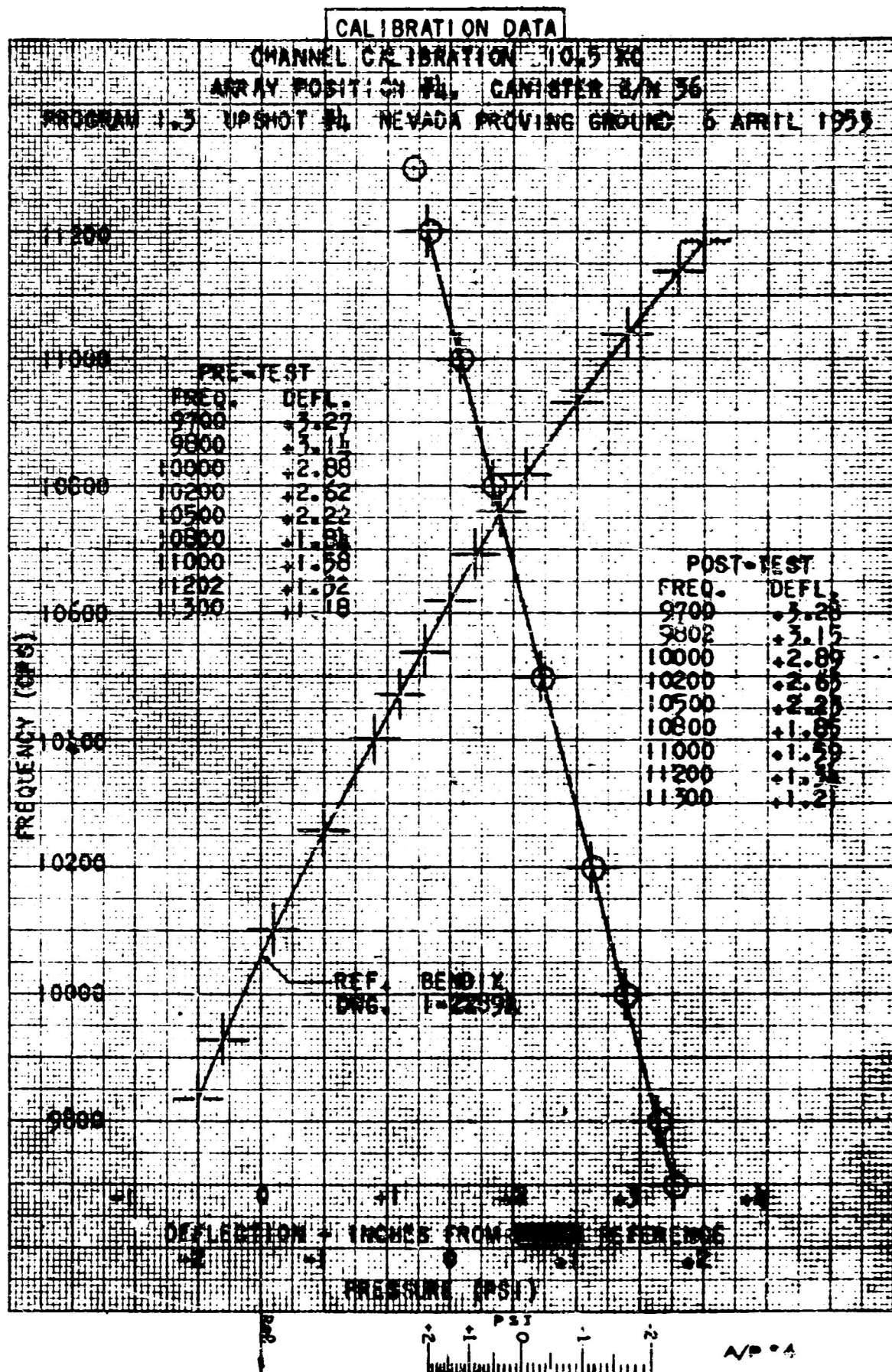


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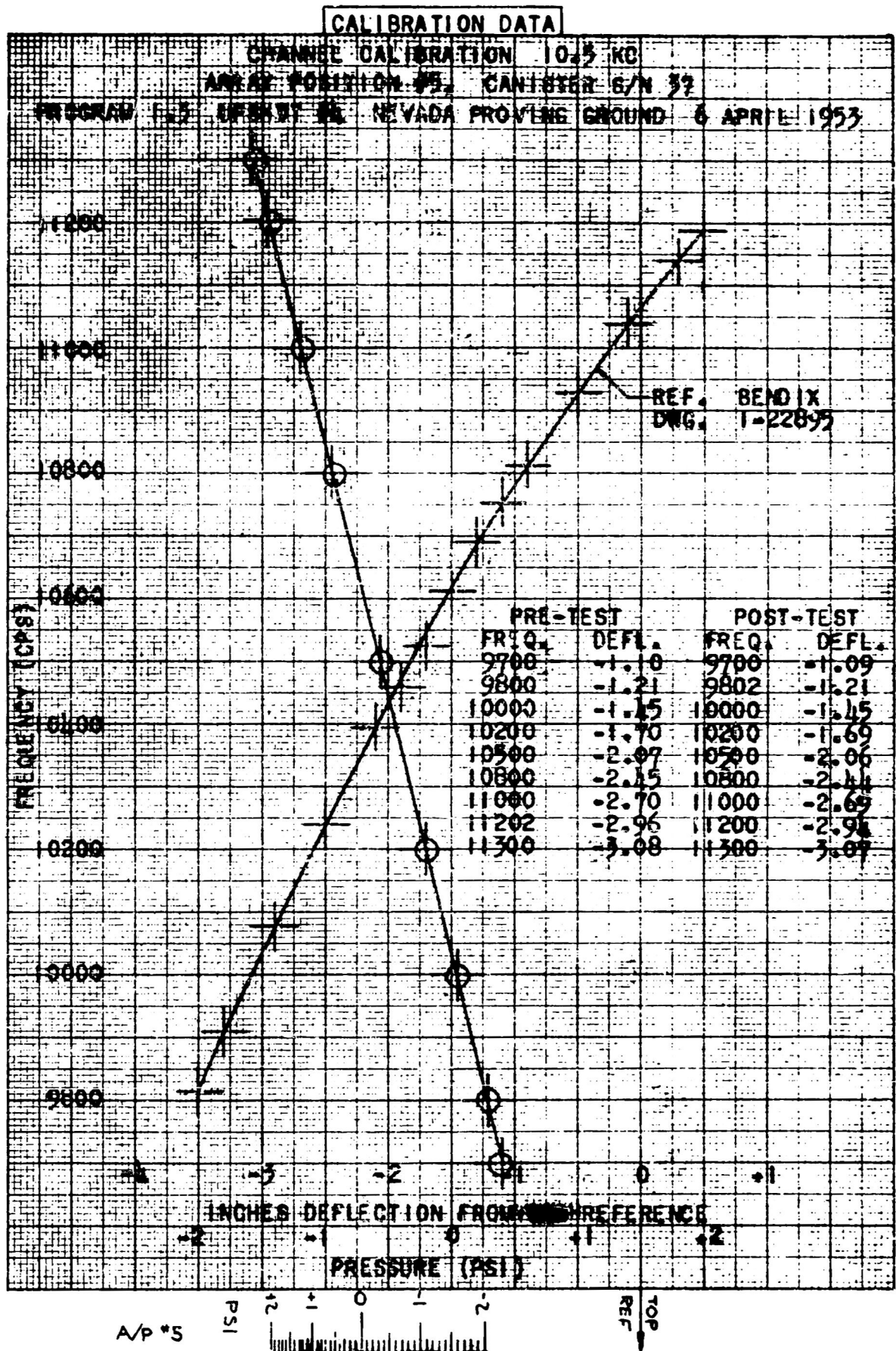


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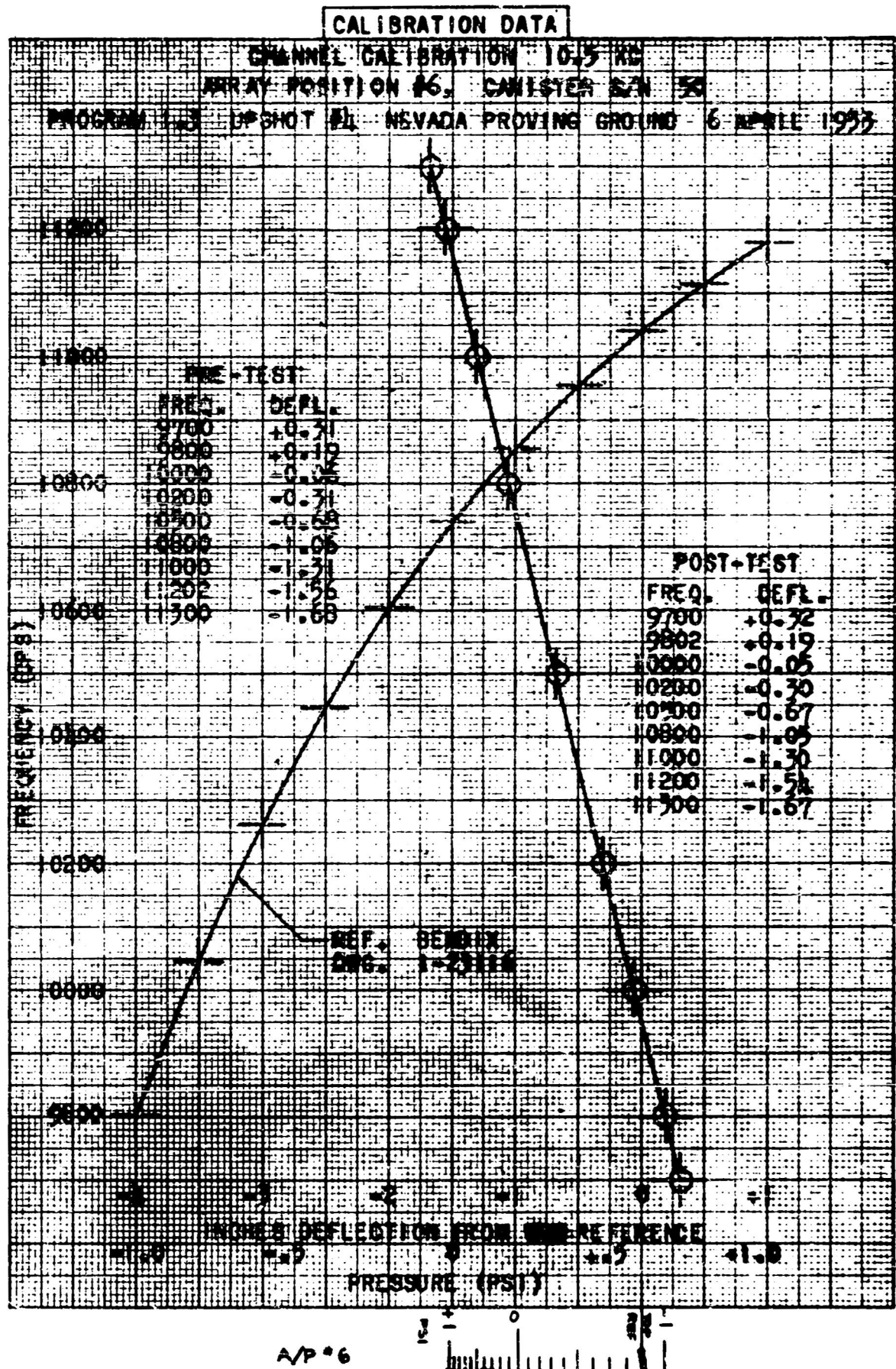


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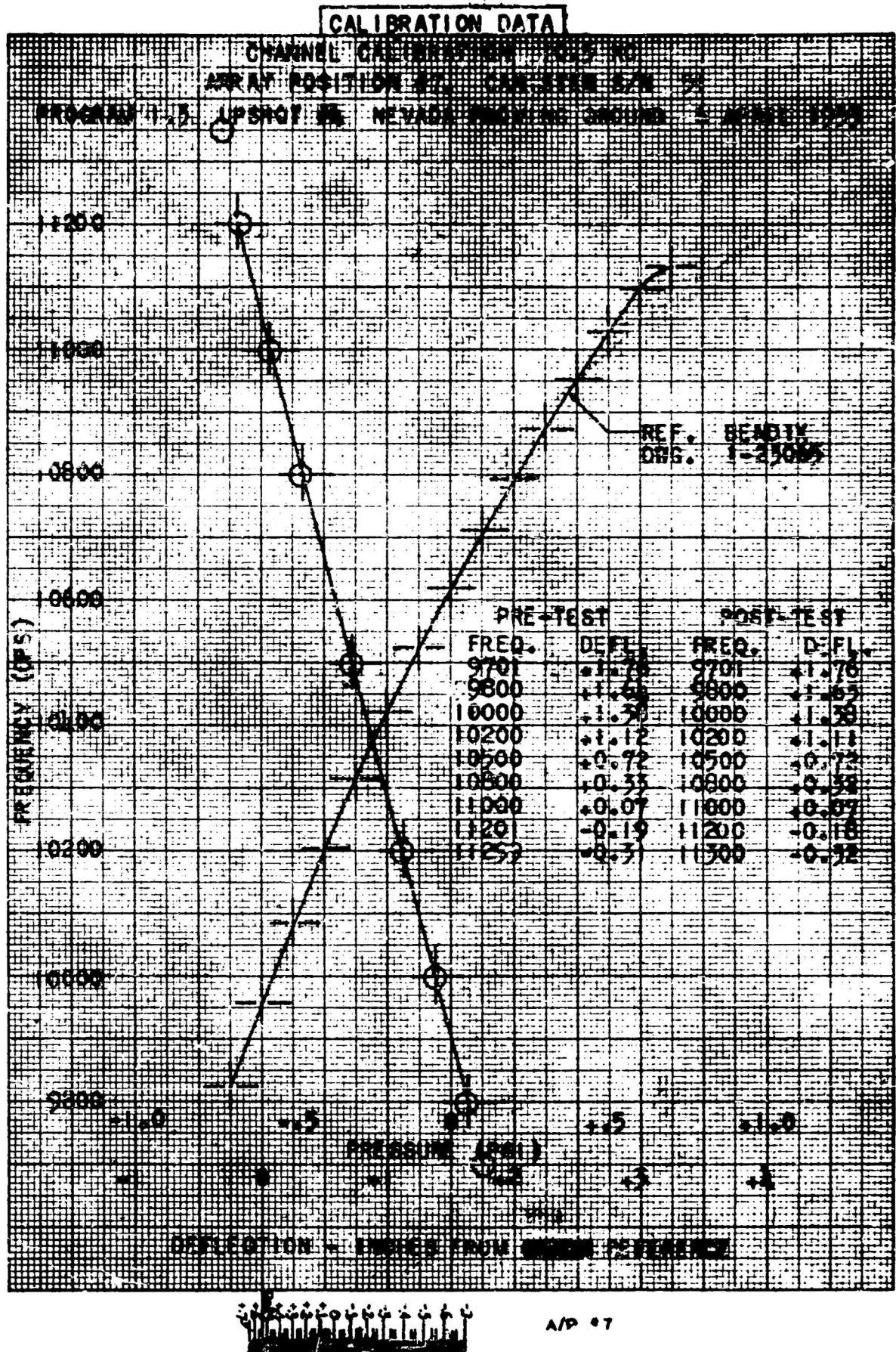


Figure 21

CALIBRATION DATA

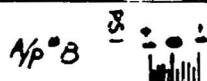


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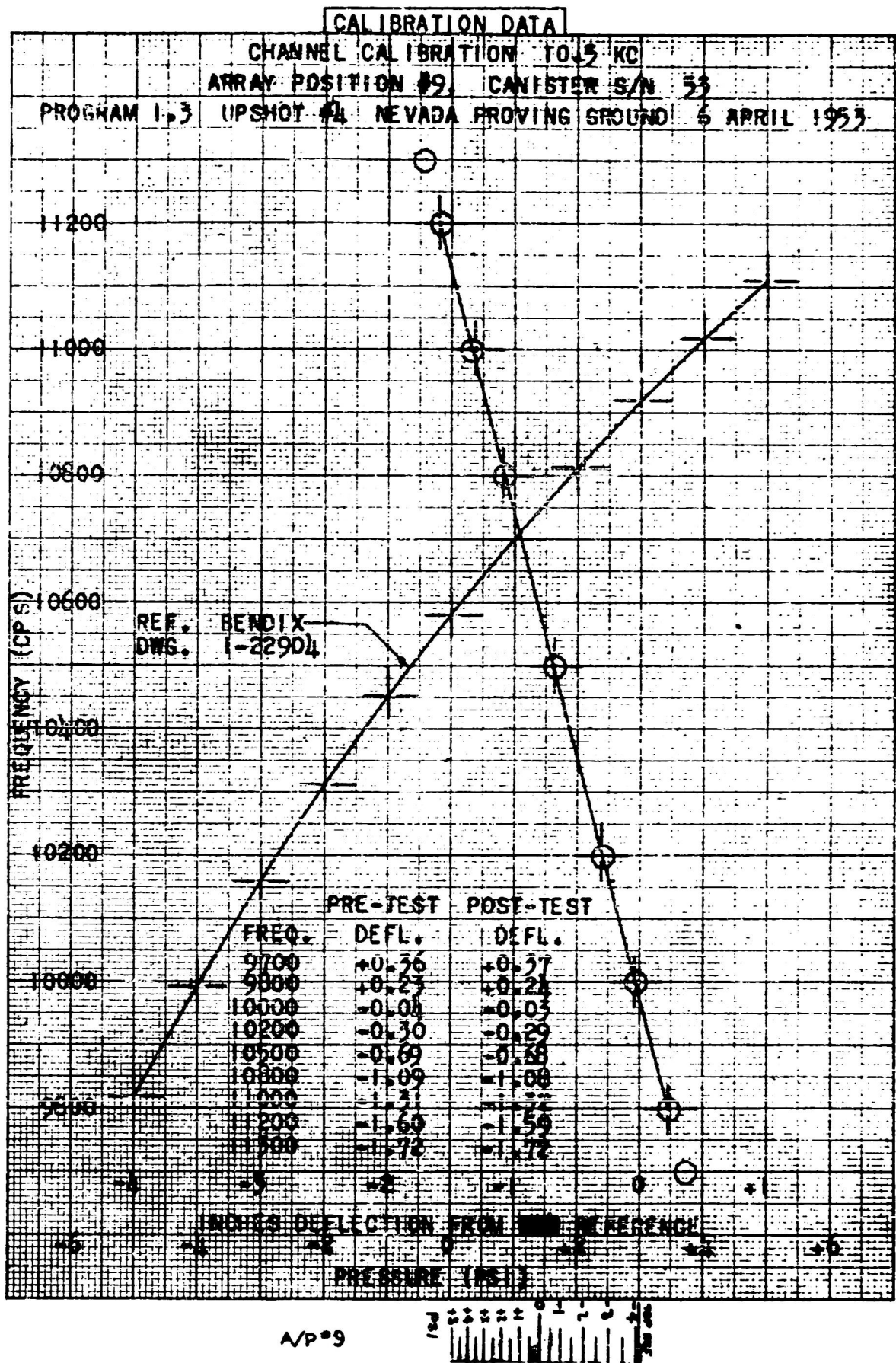


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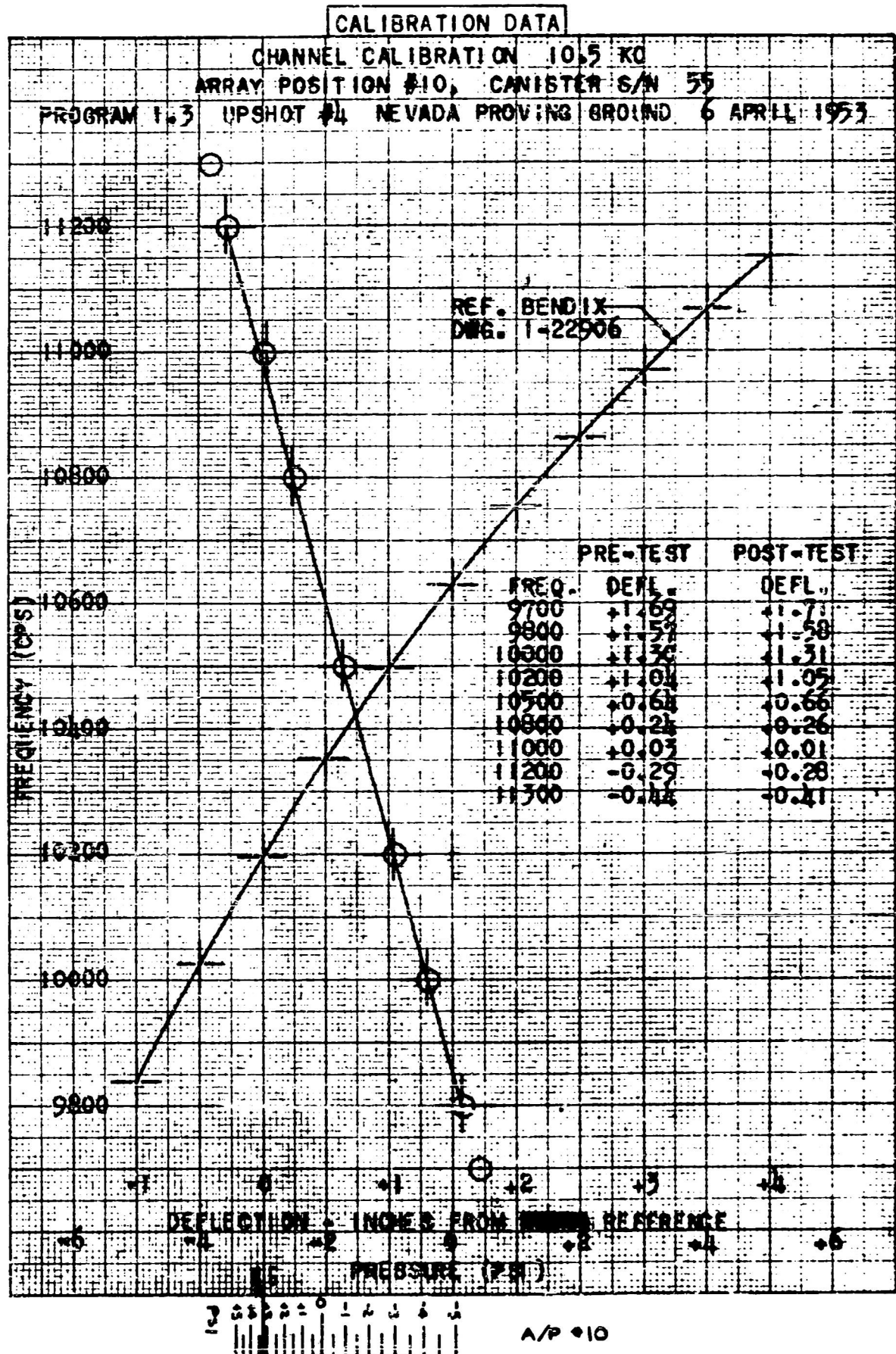


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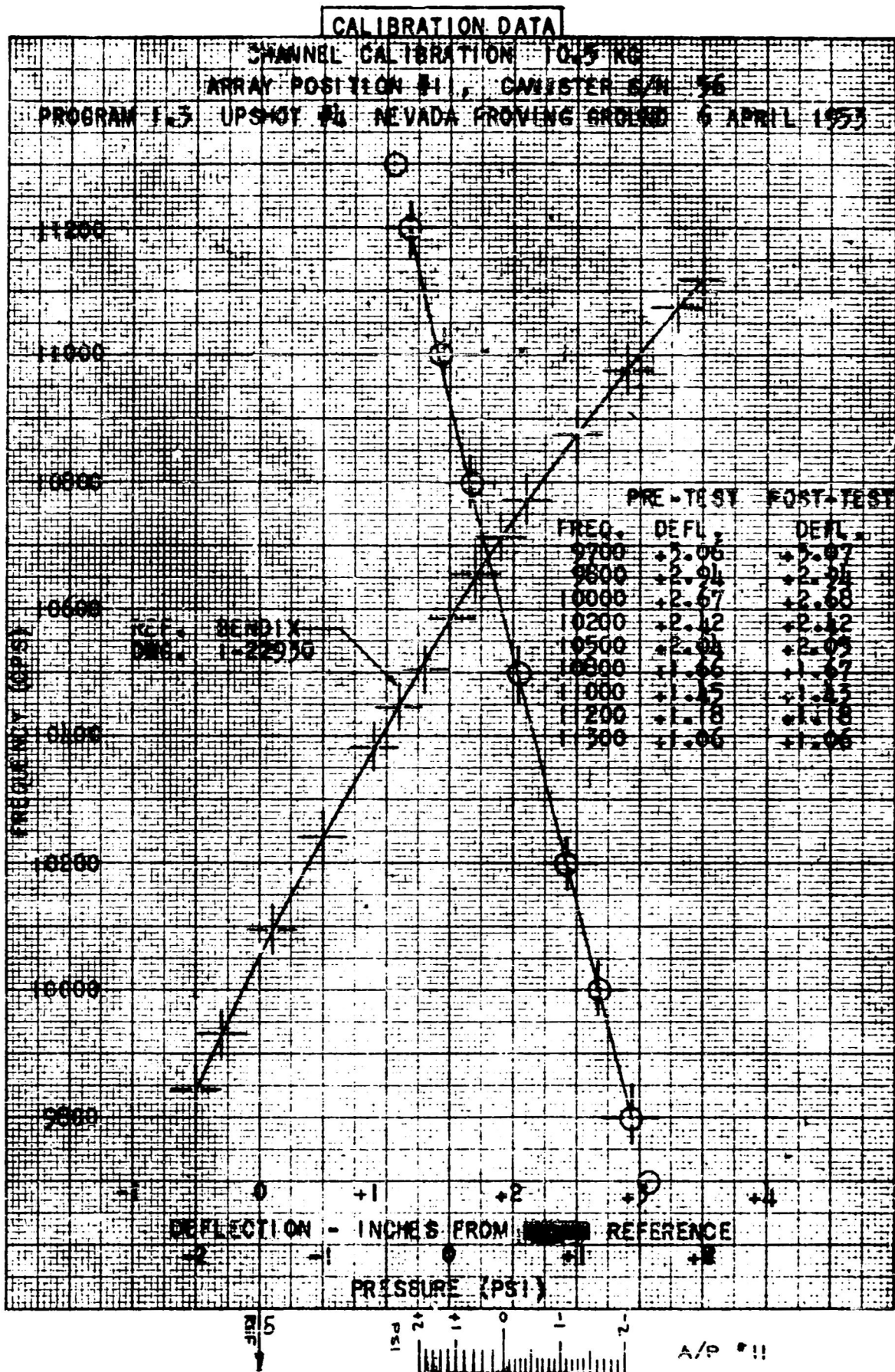


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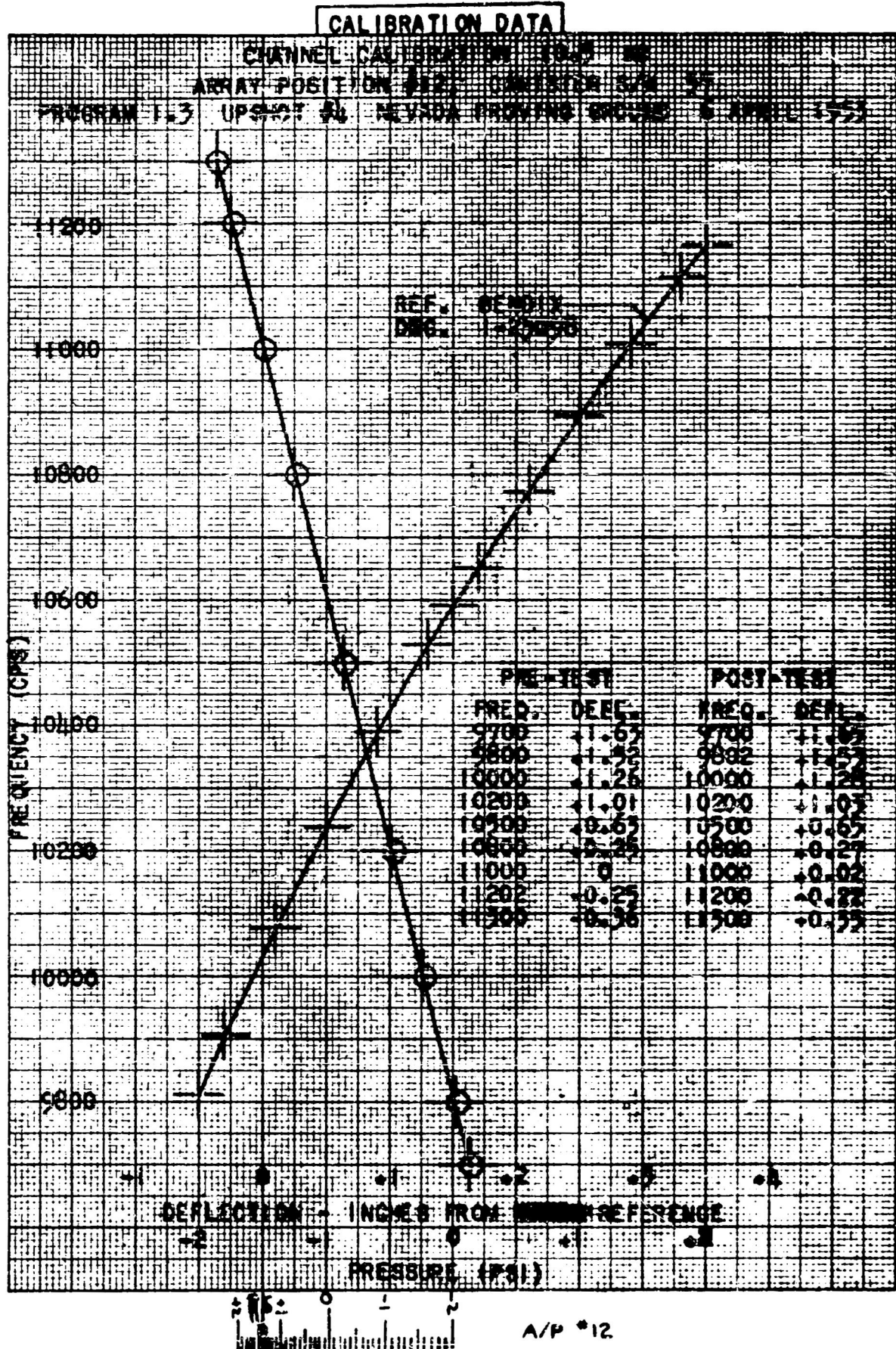


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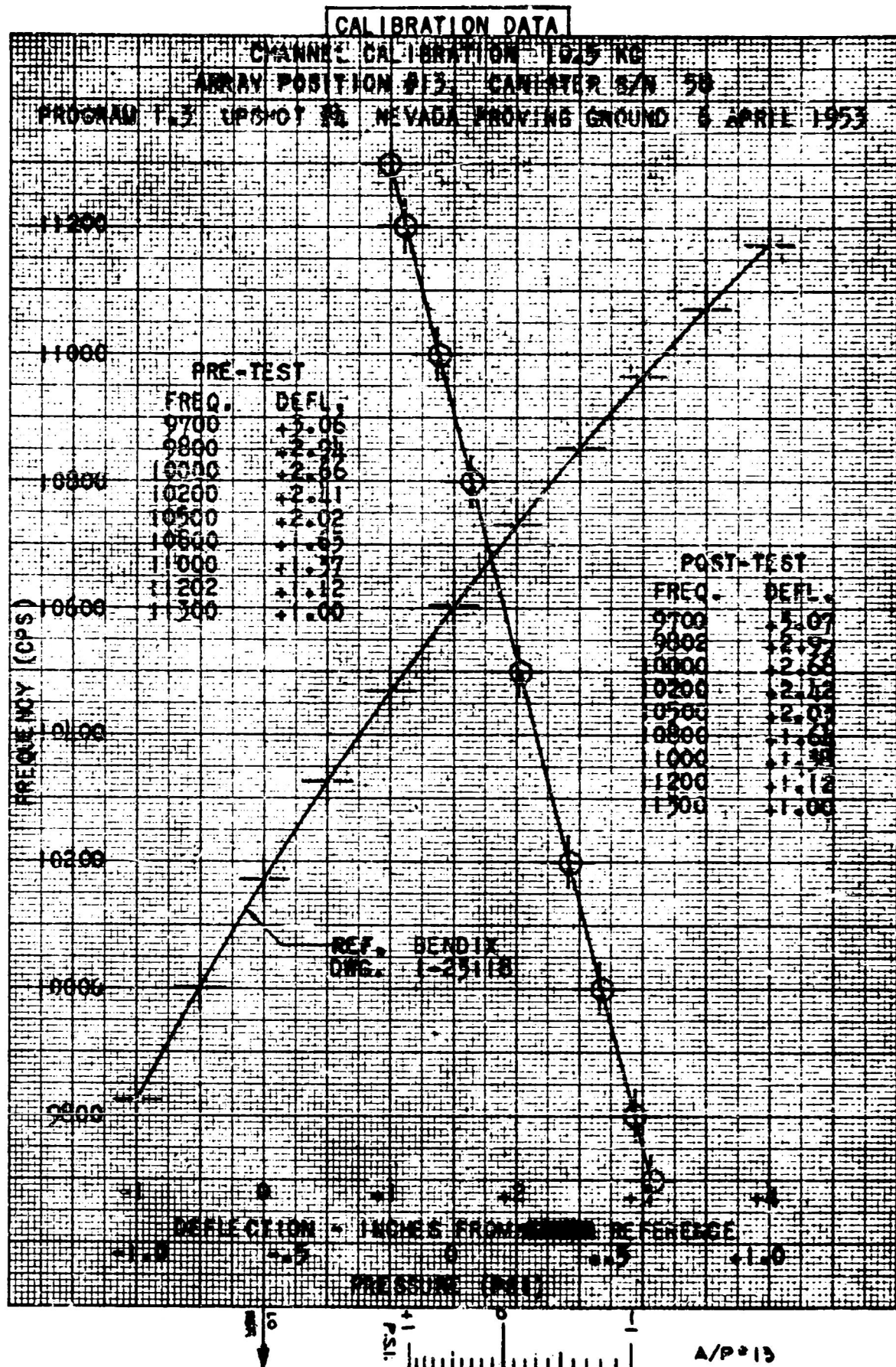


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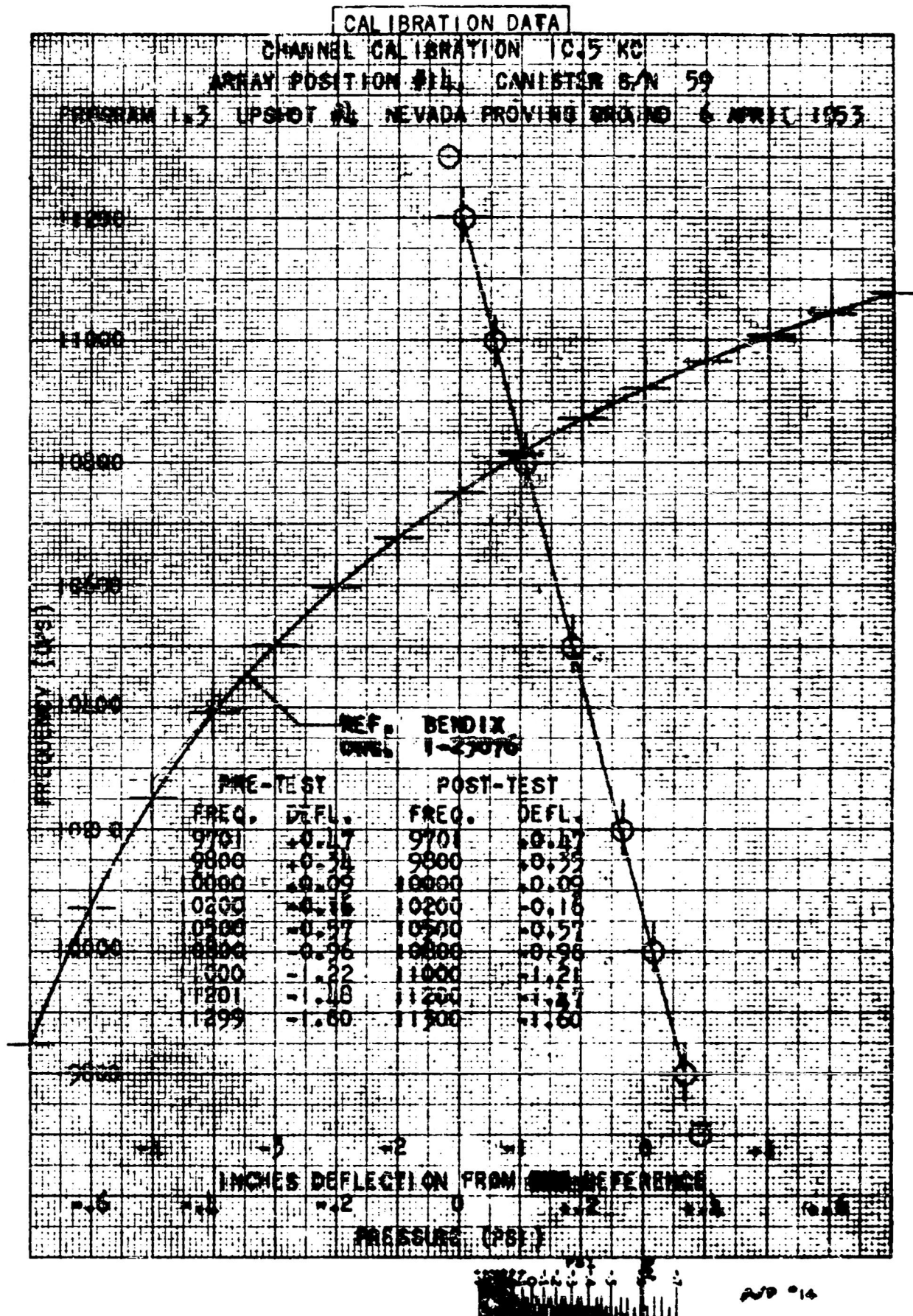


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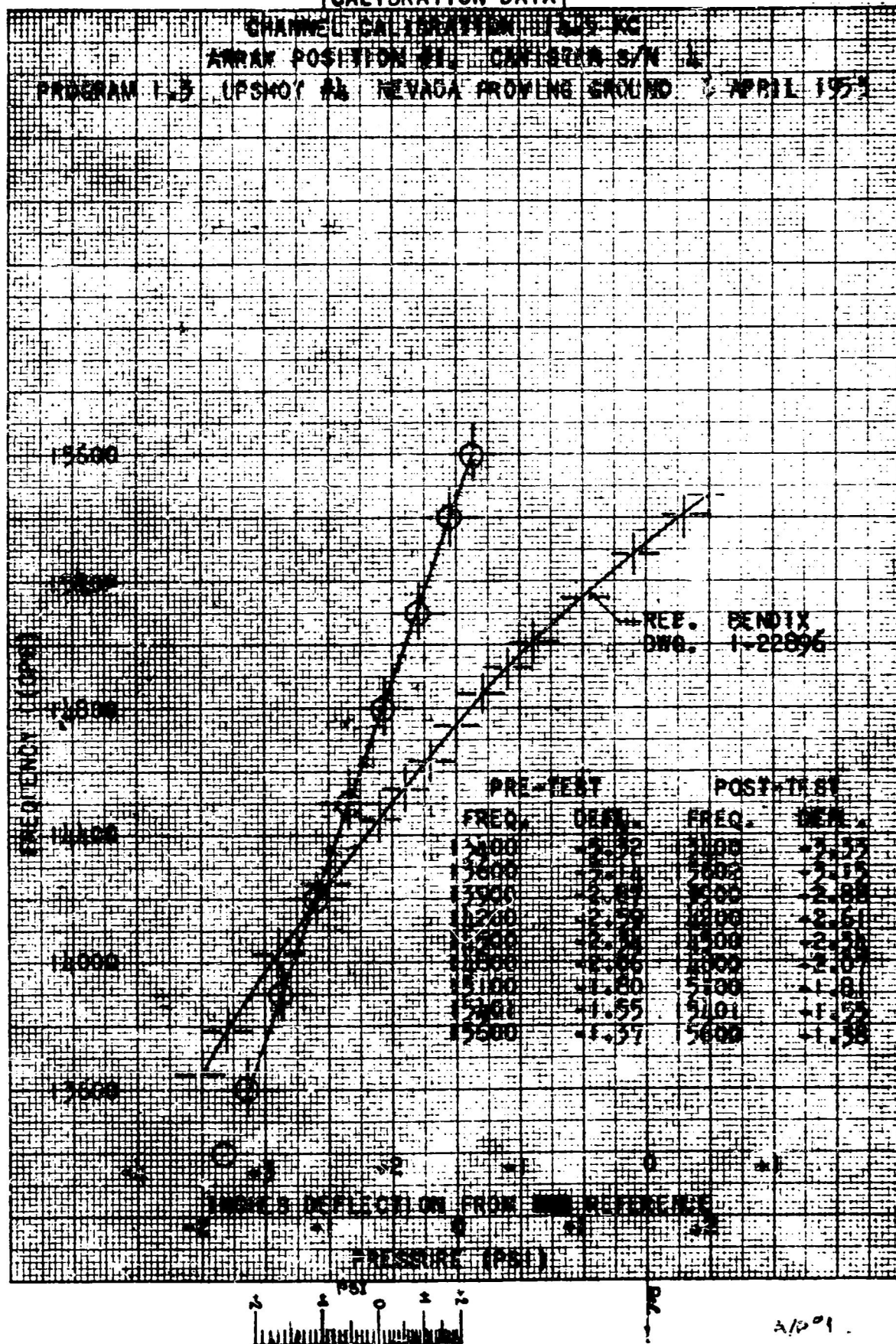


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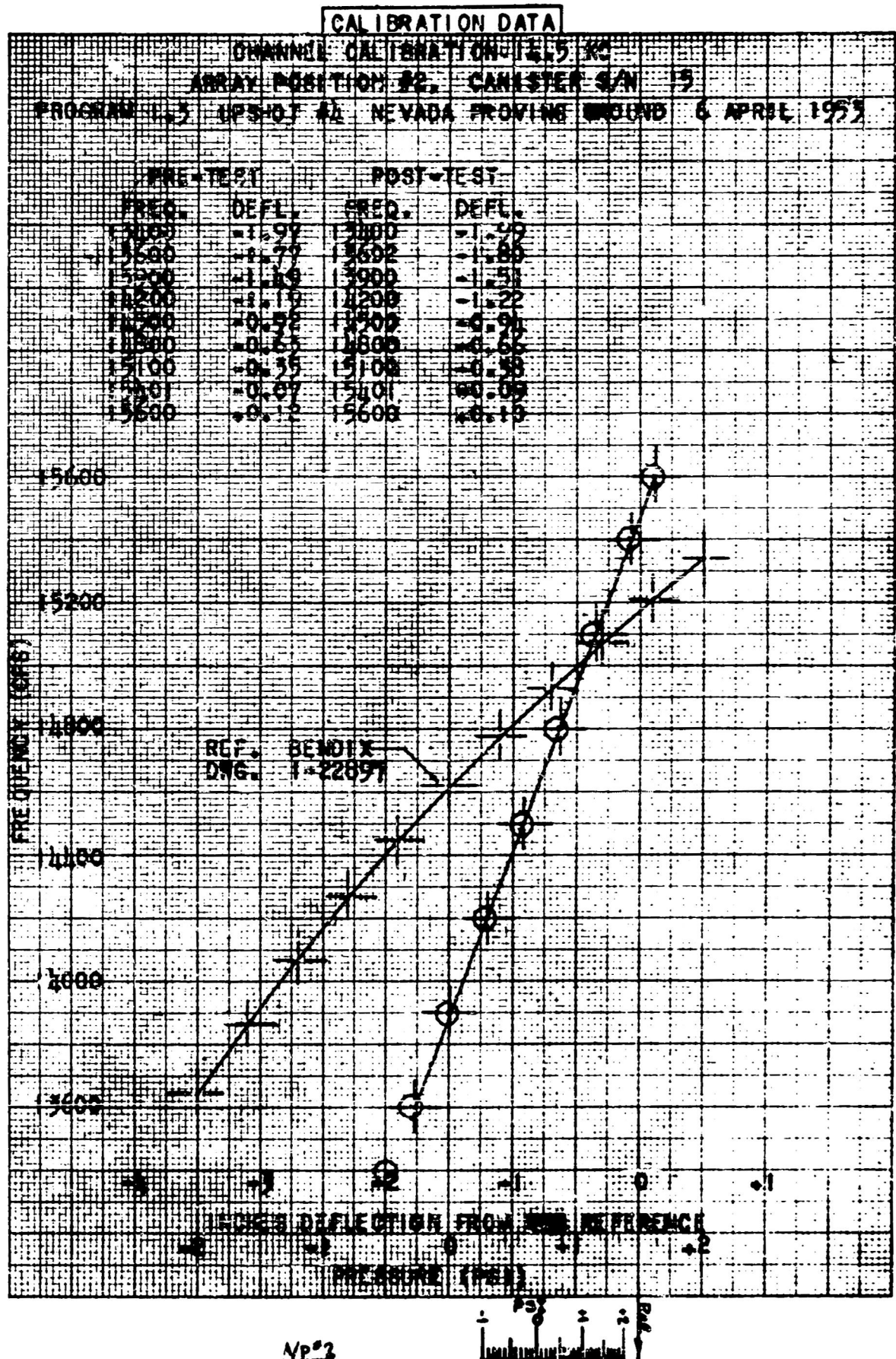


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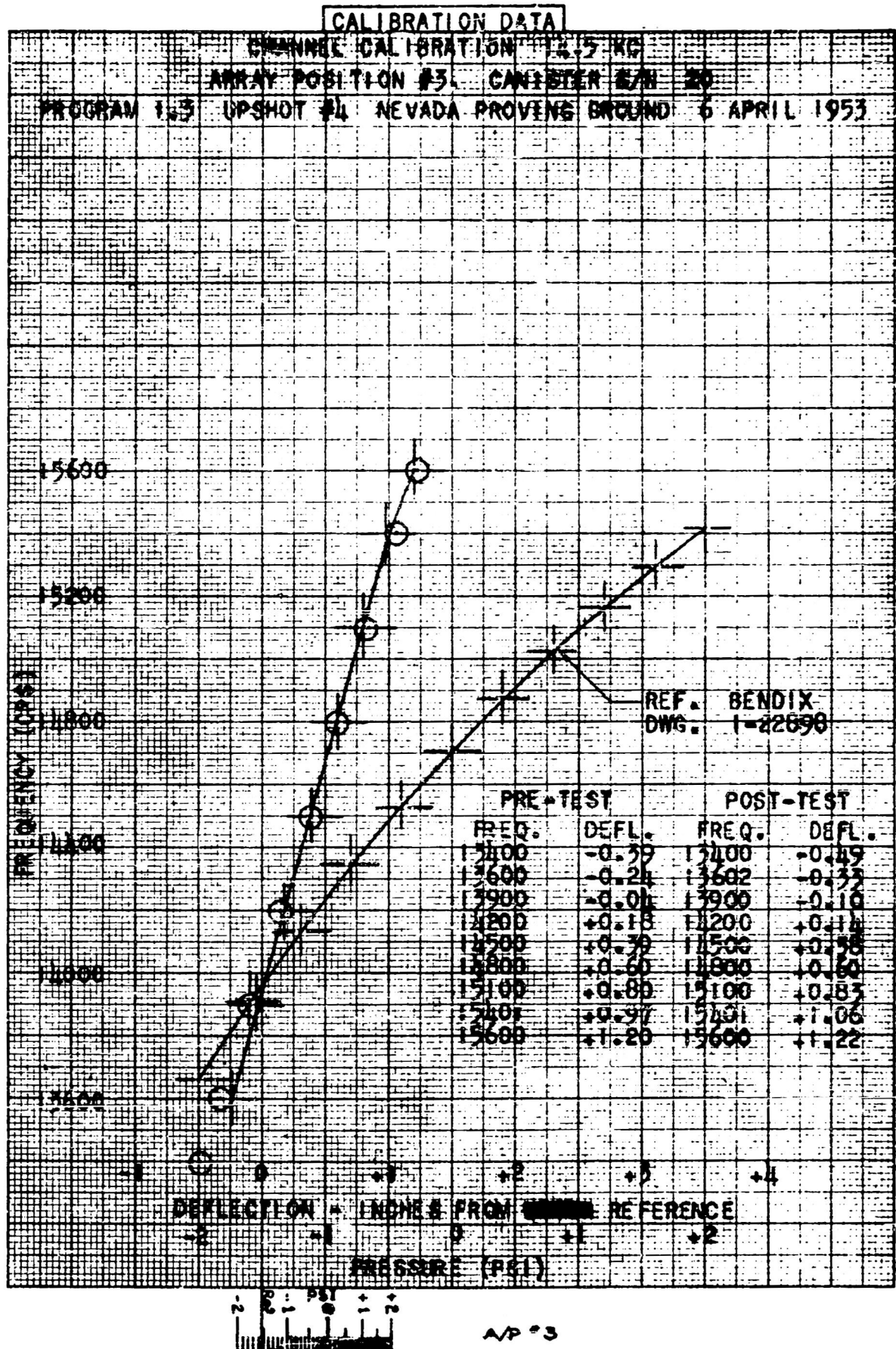


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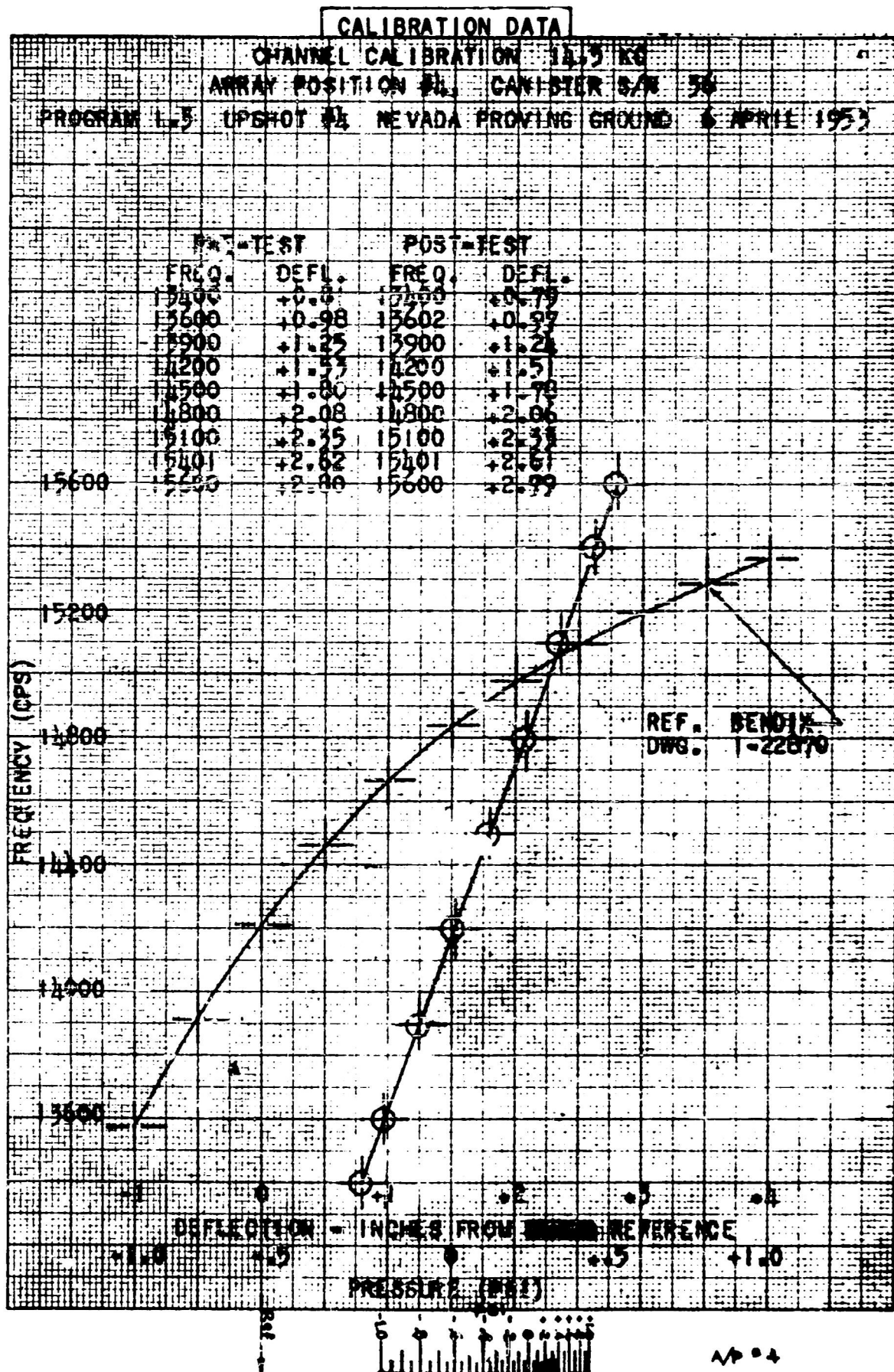


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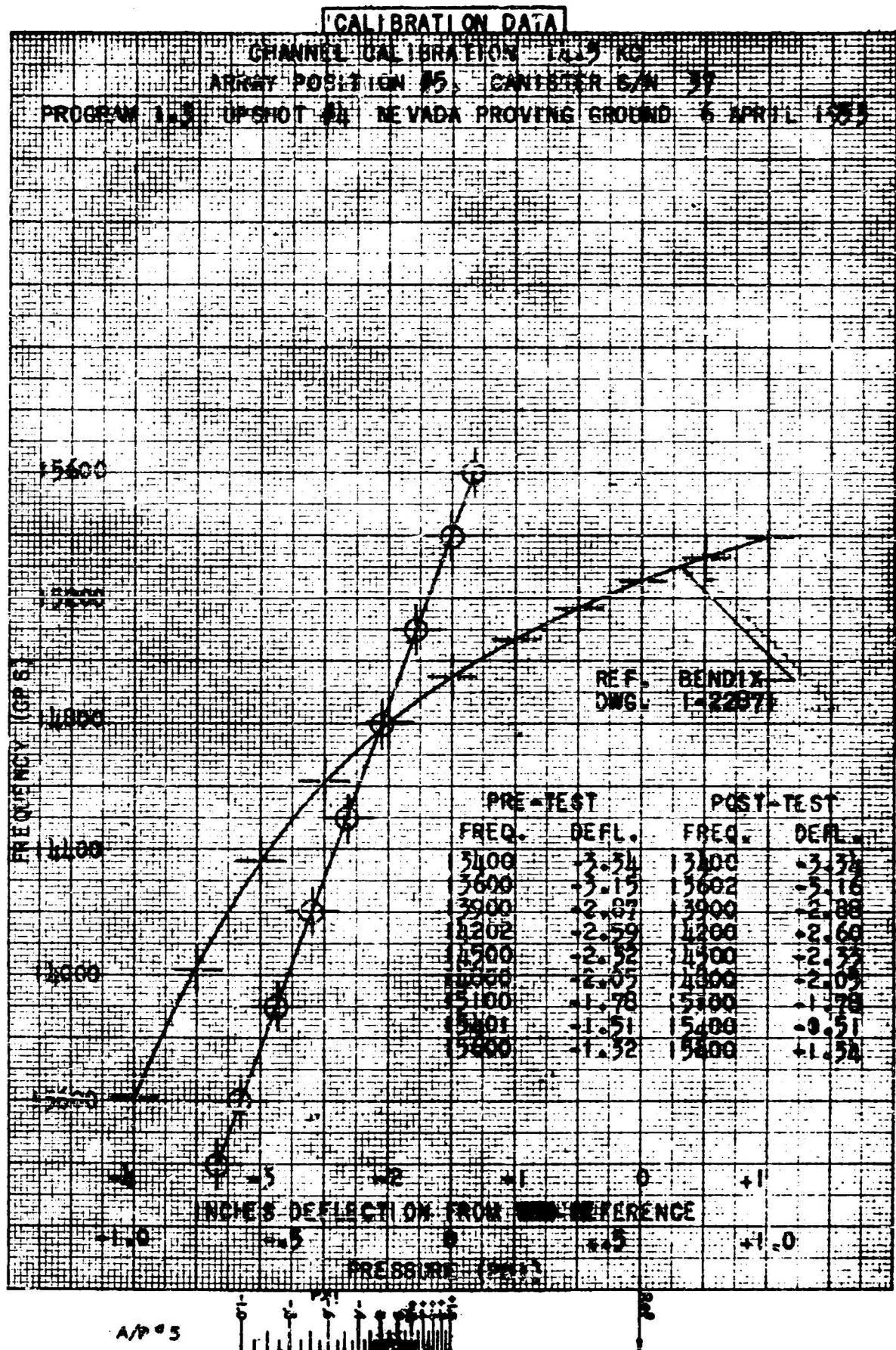


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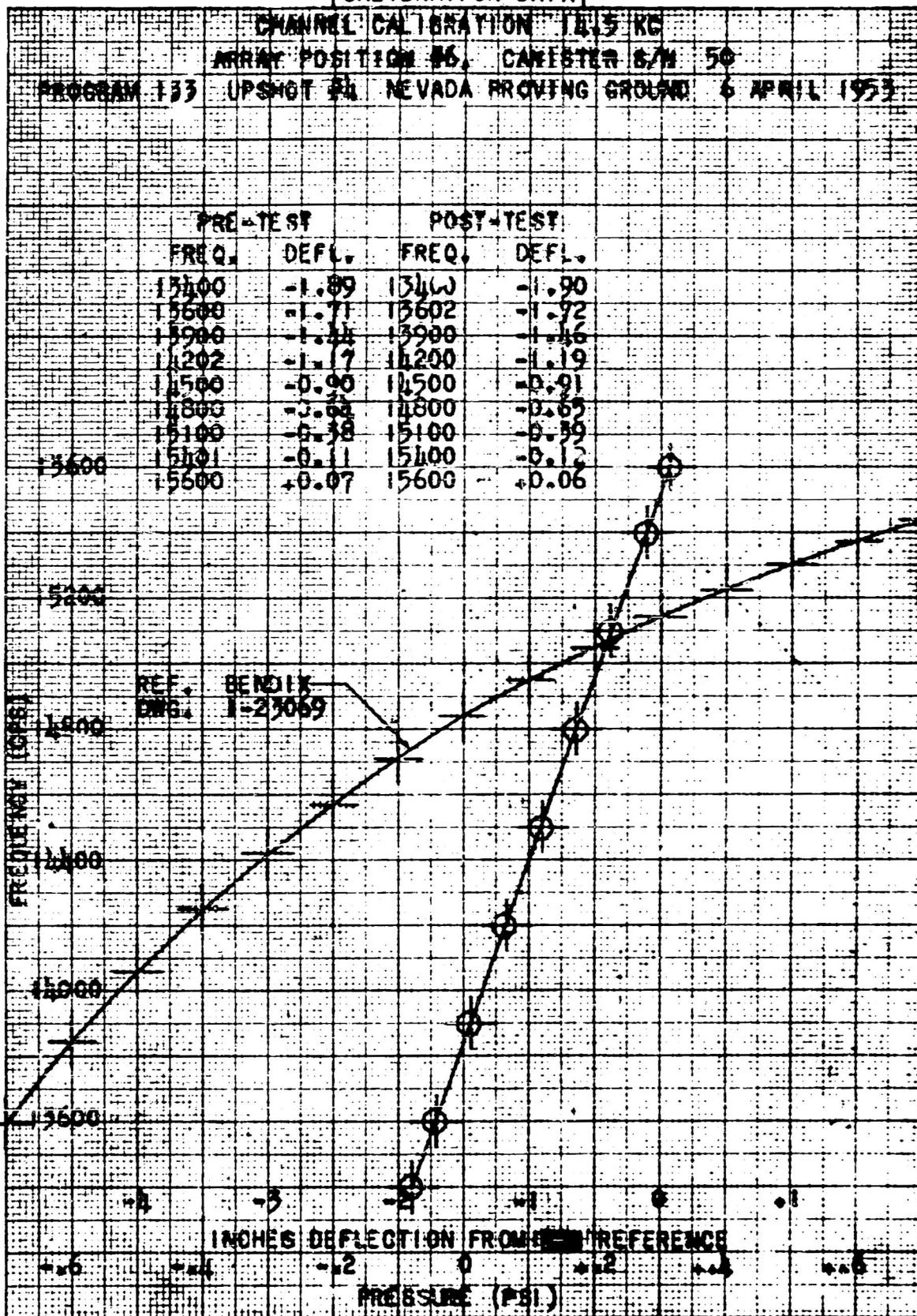


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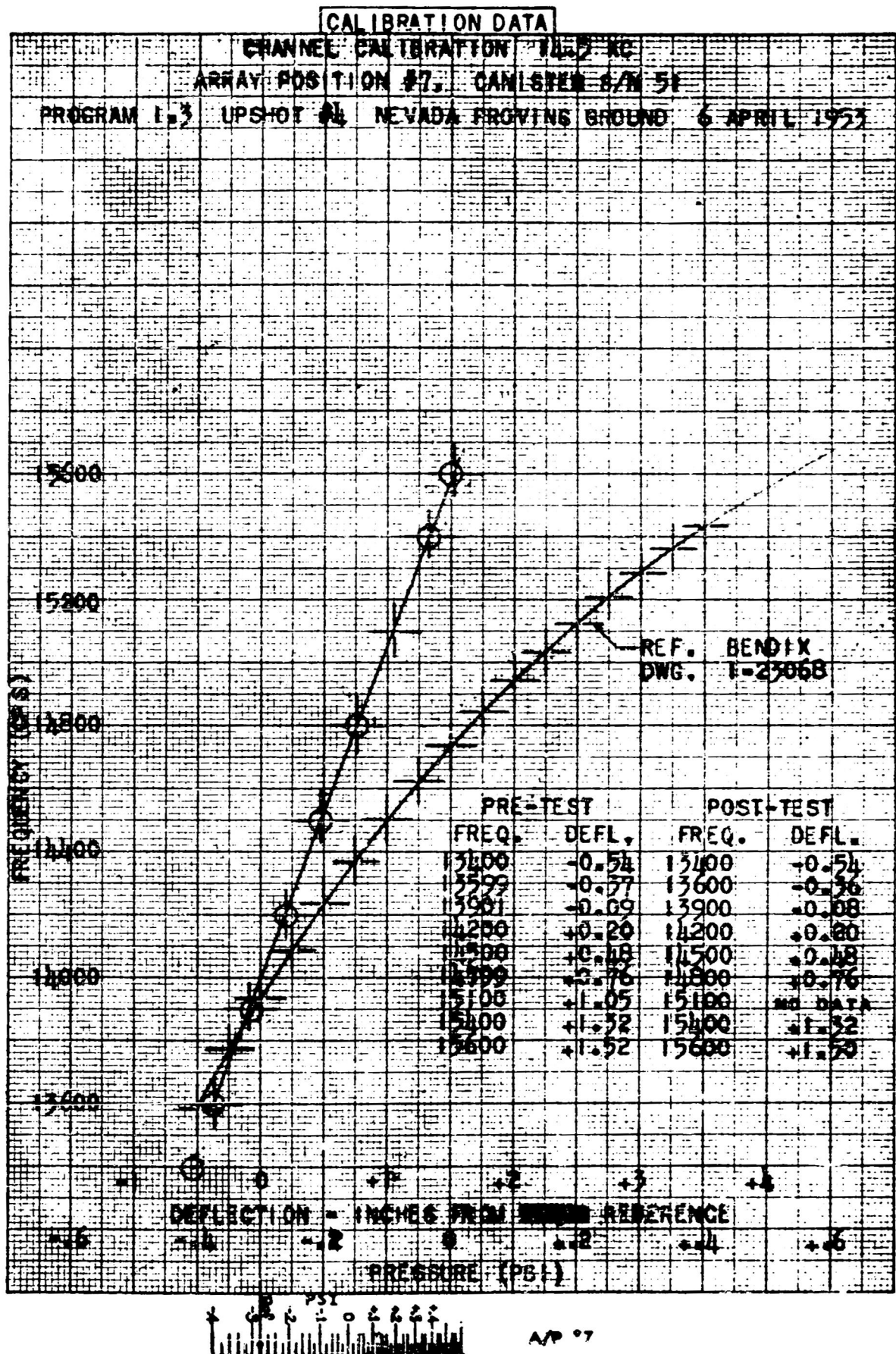


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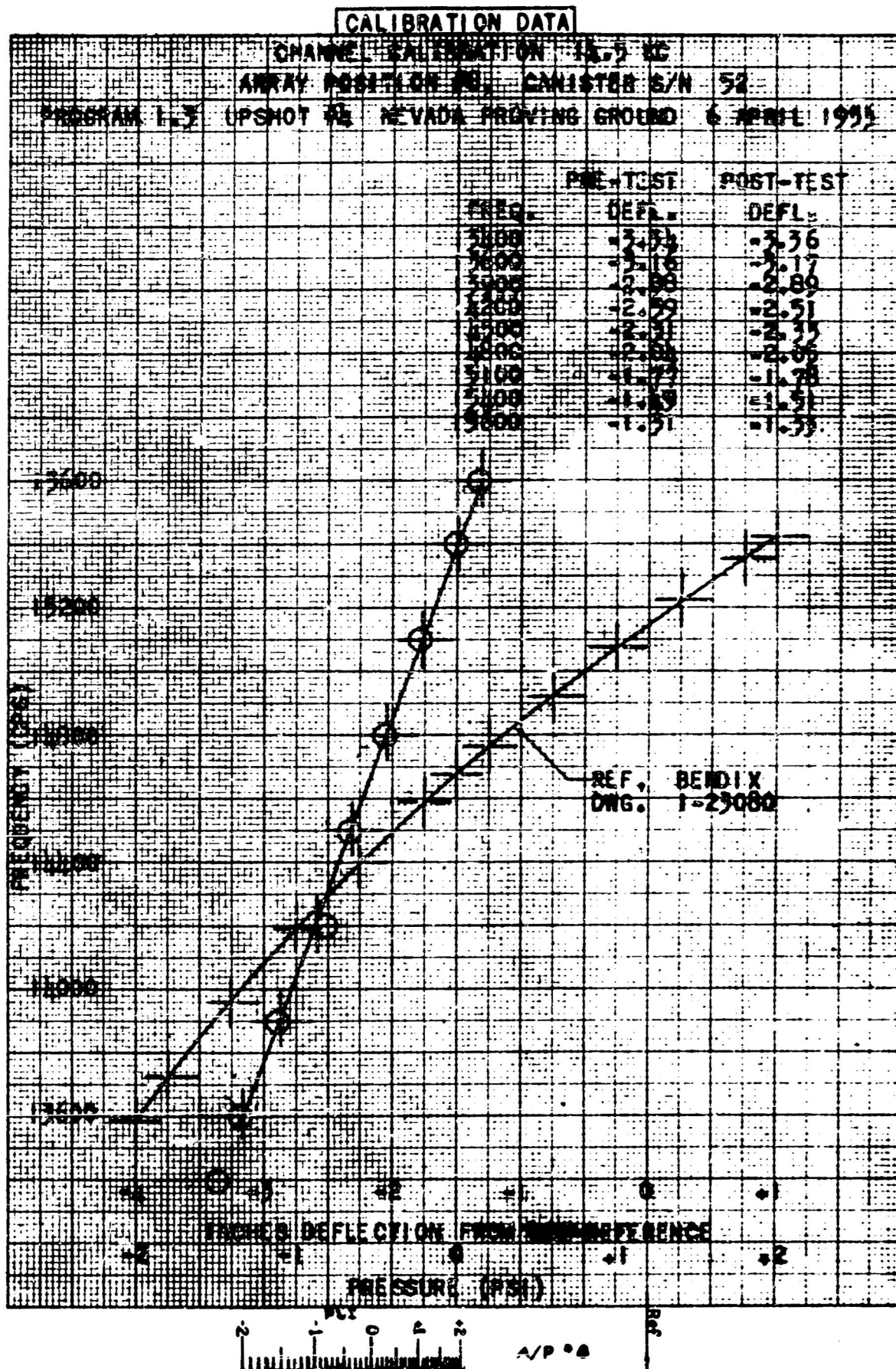


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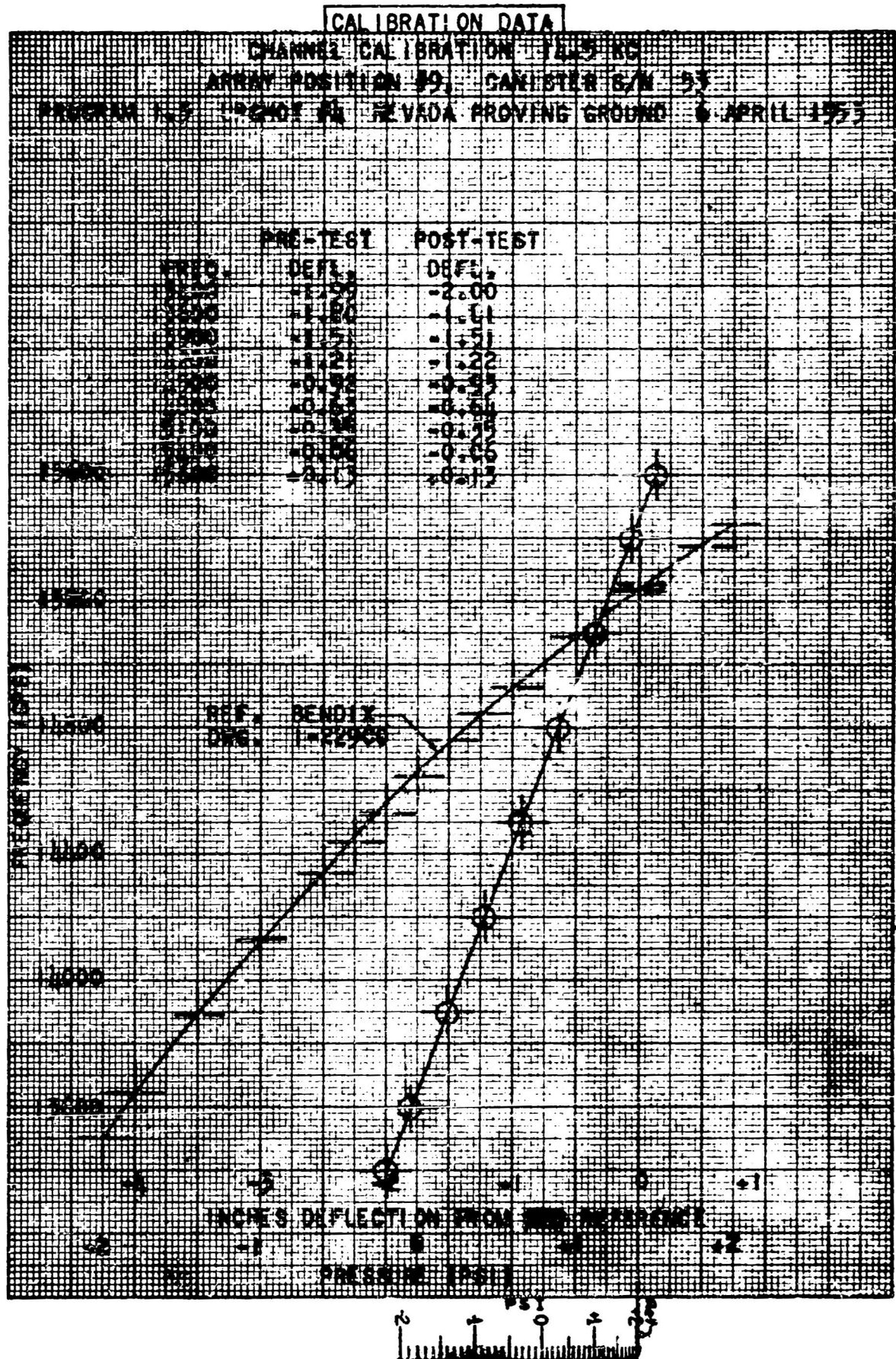
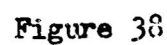


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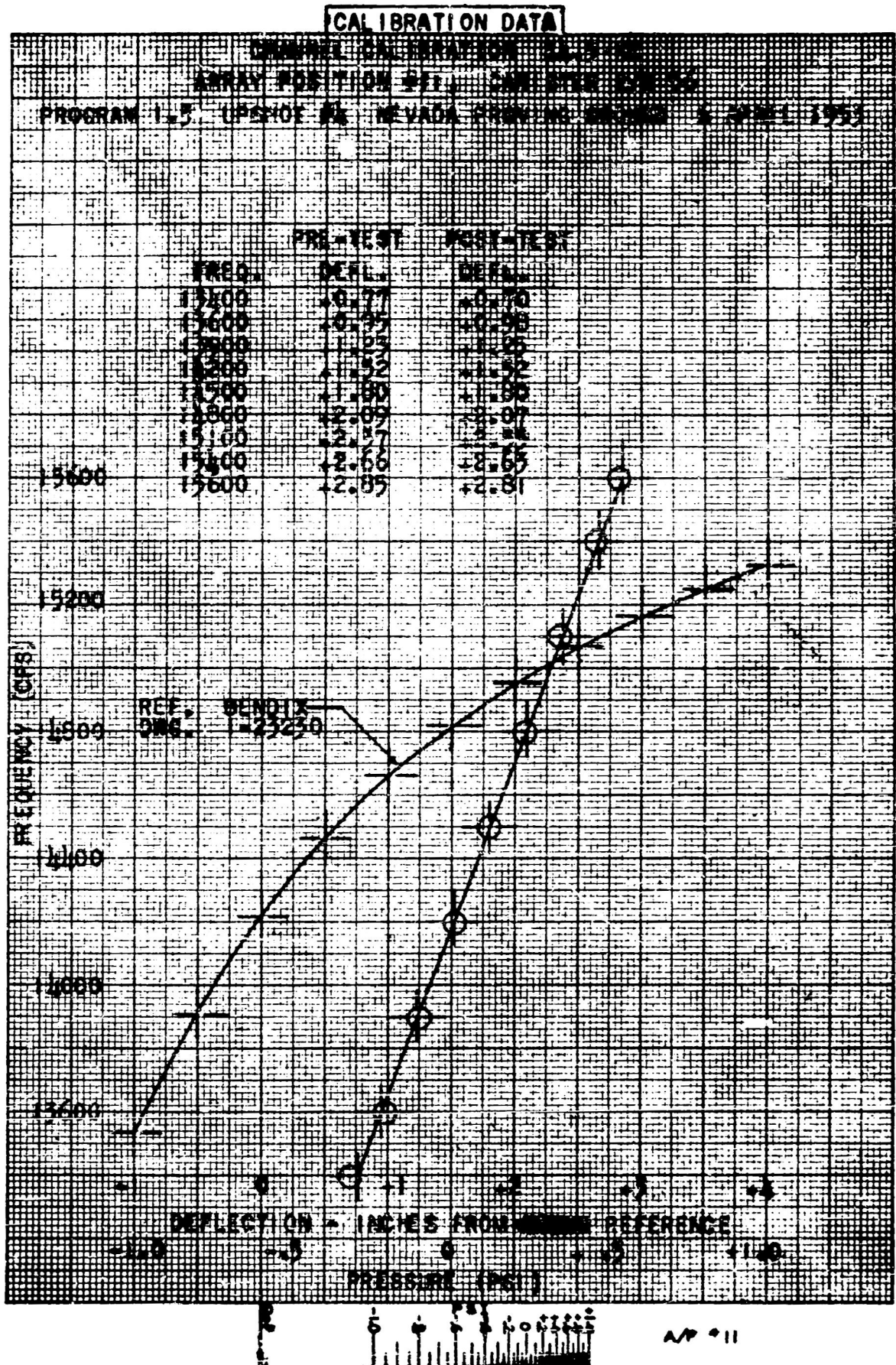


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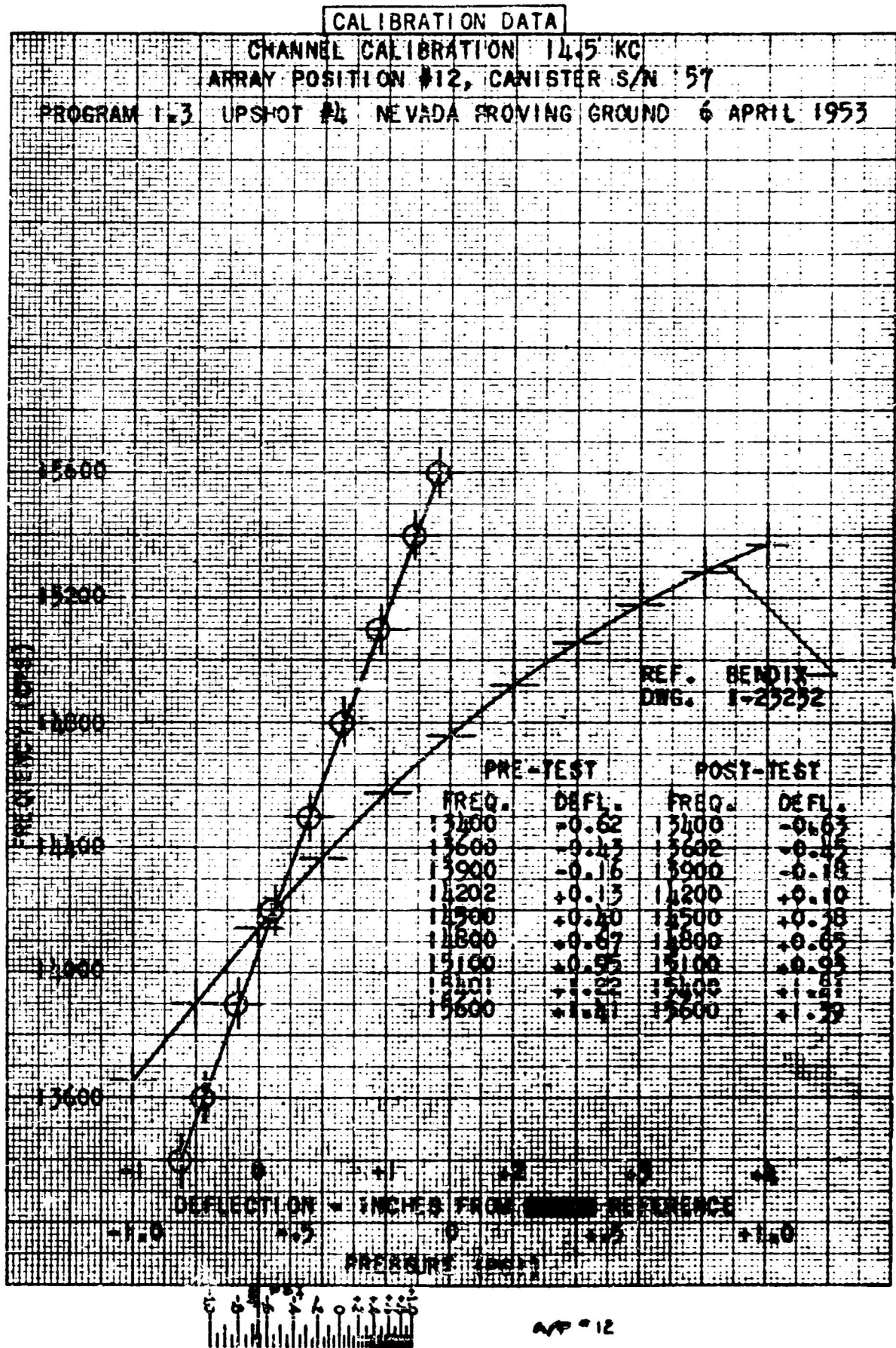


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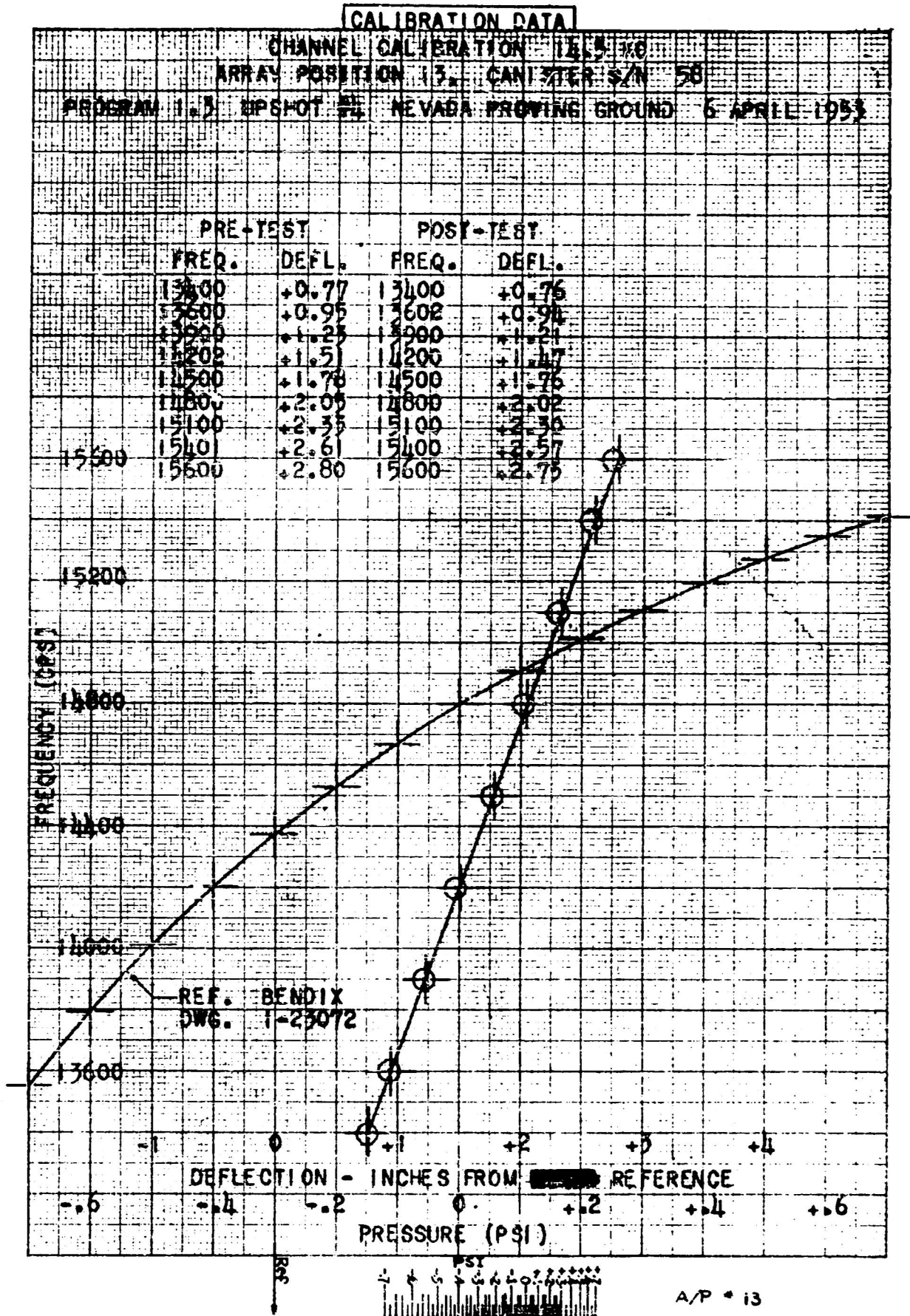


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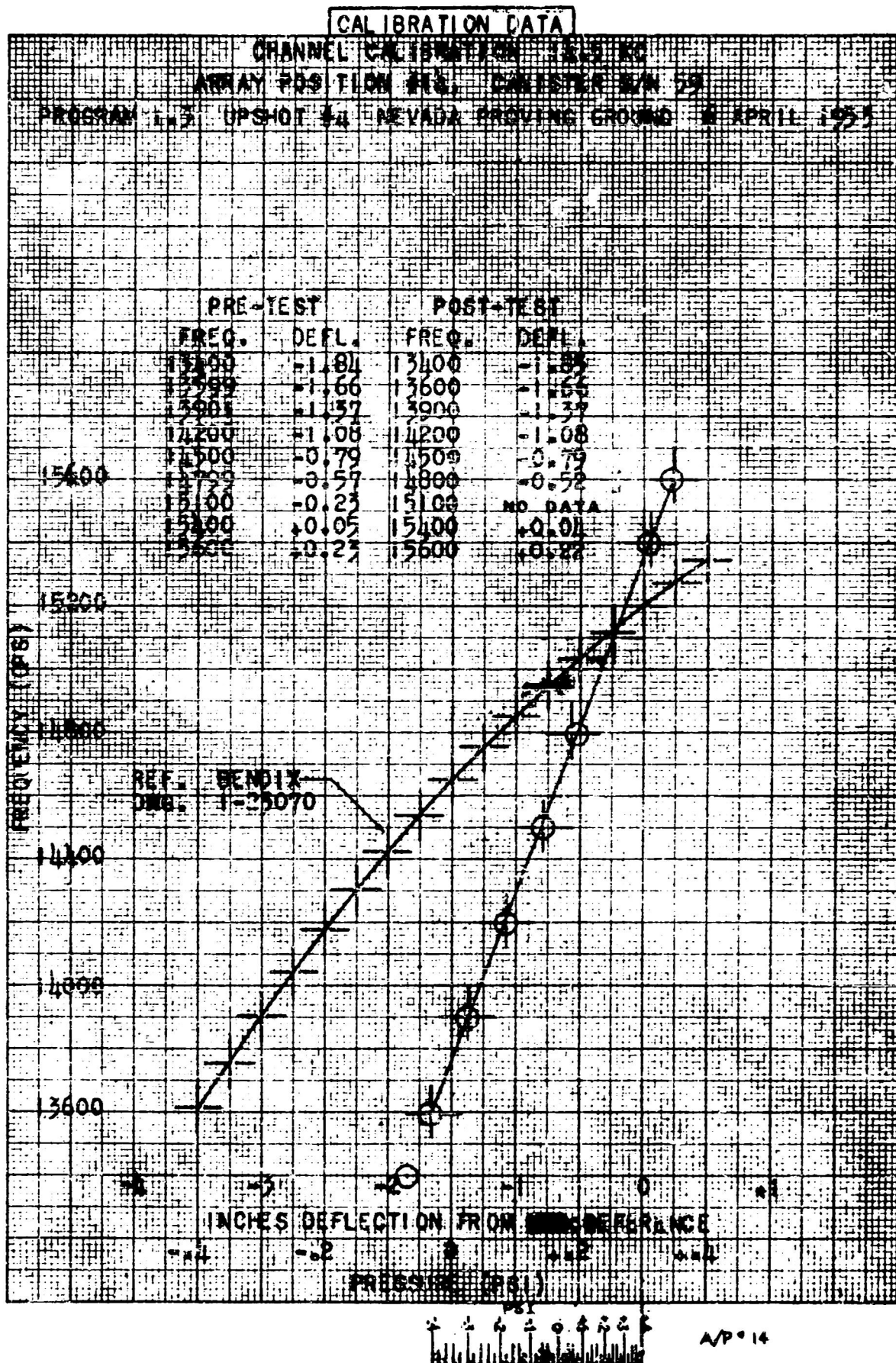


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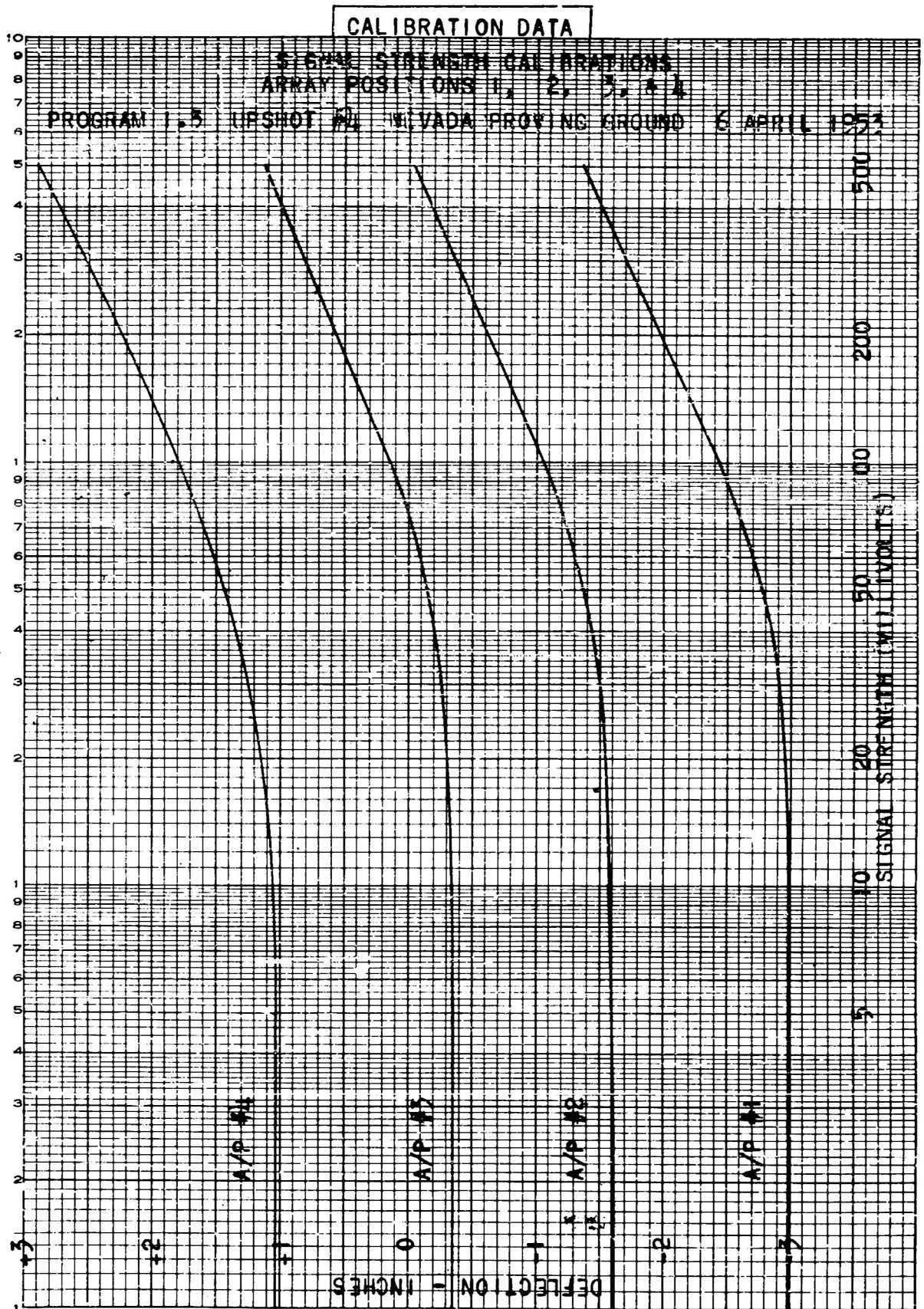


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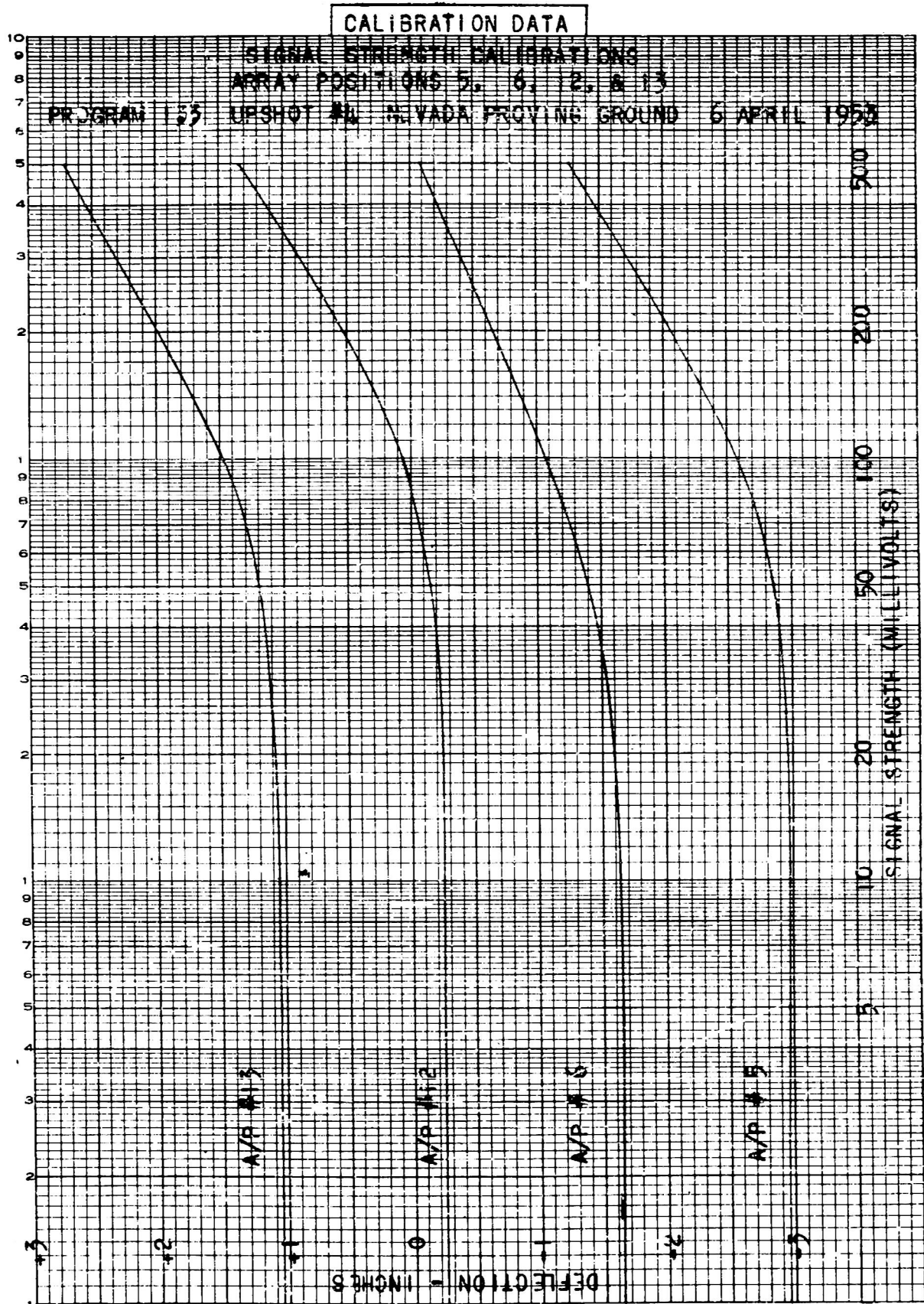


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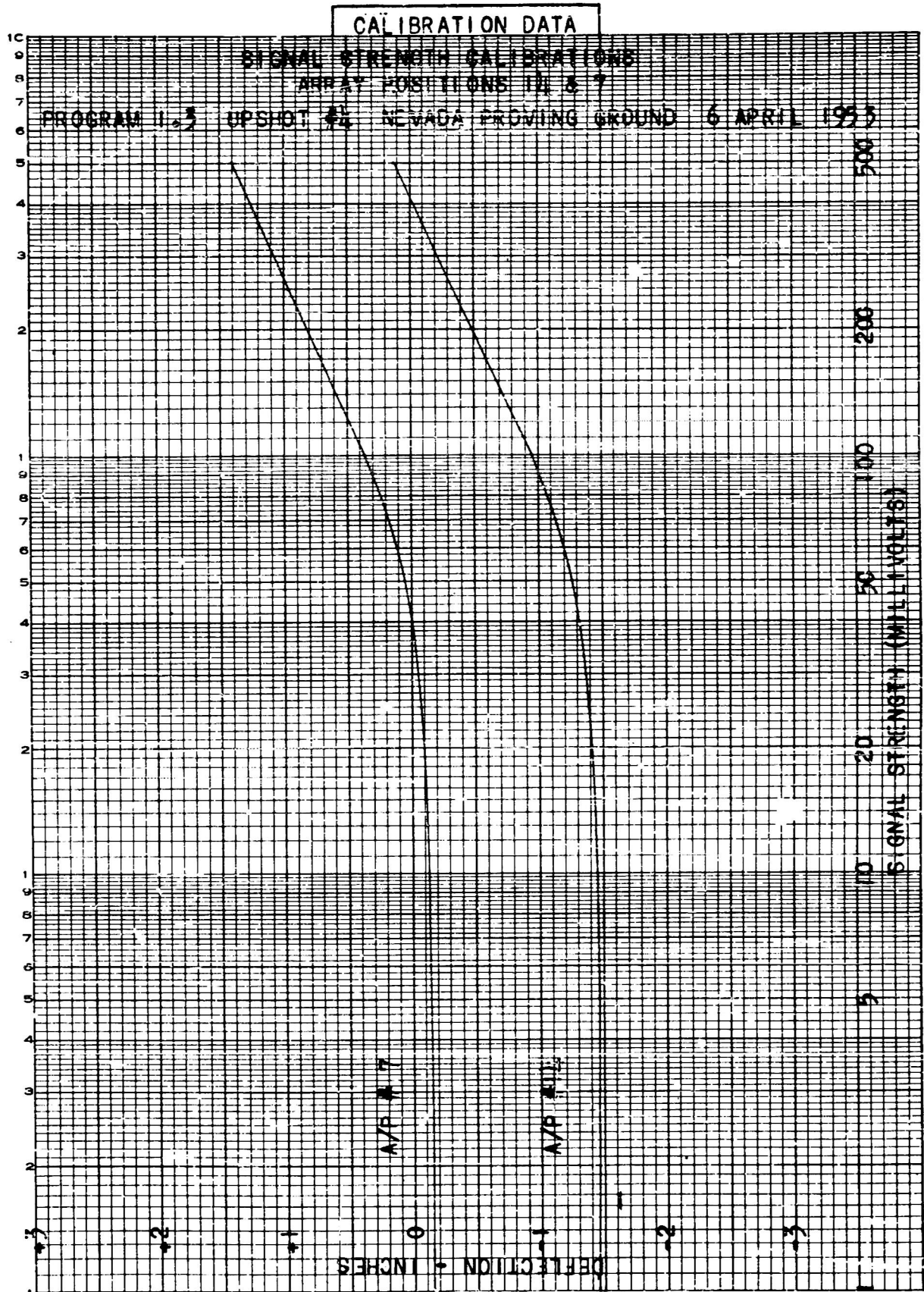


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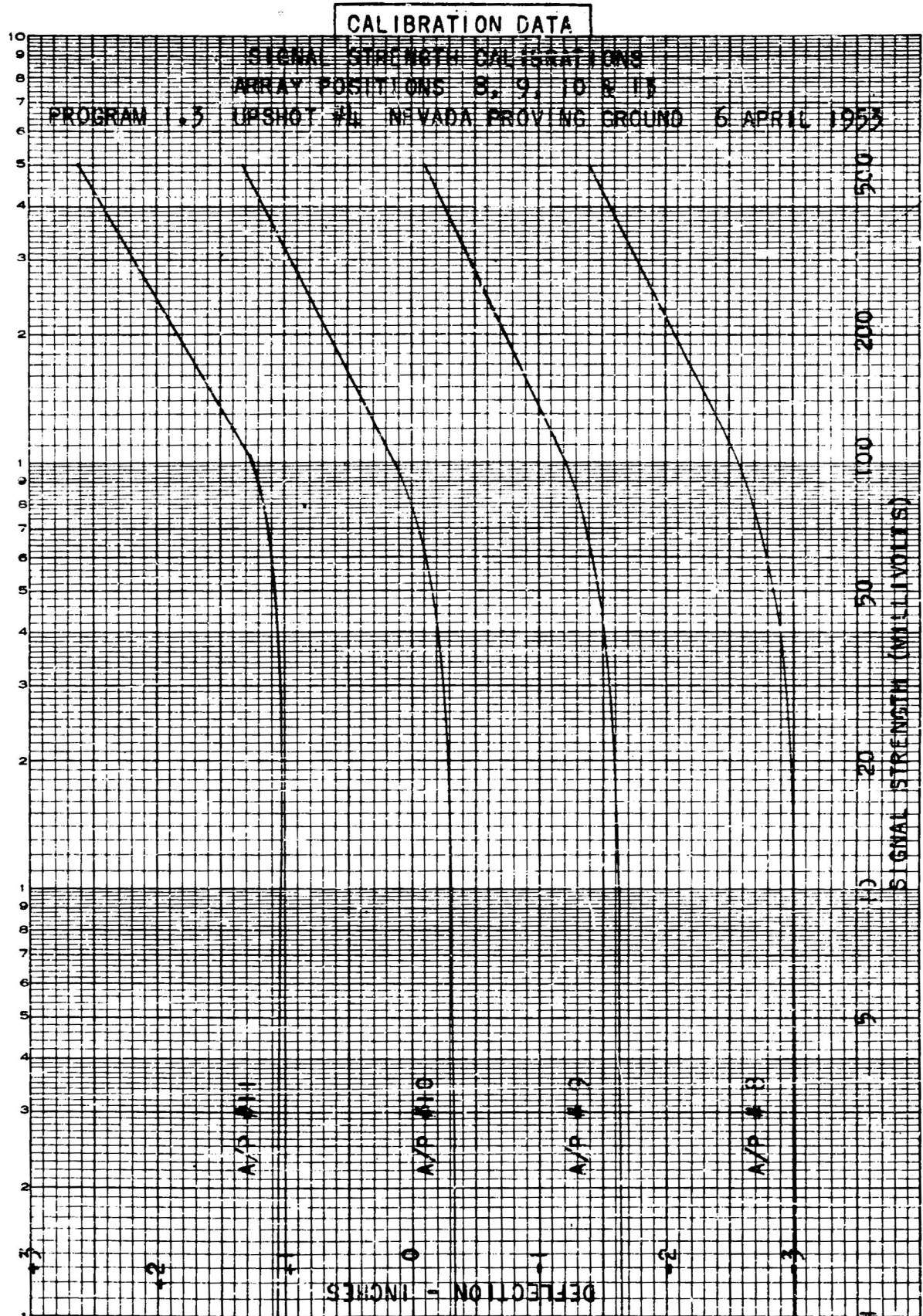


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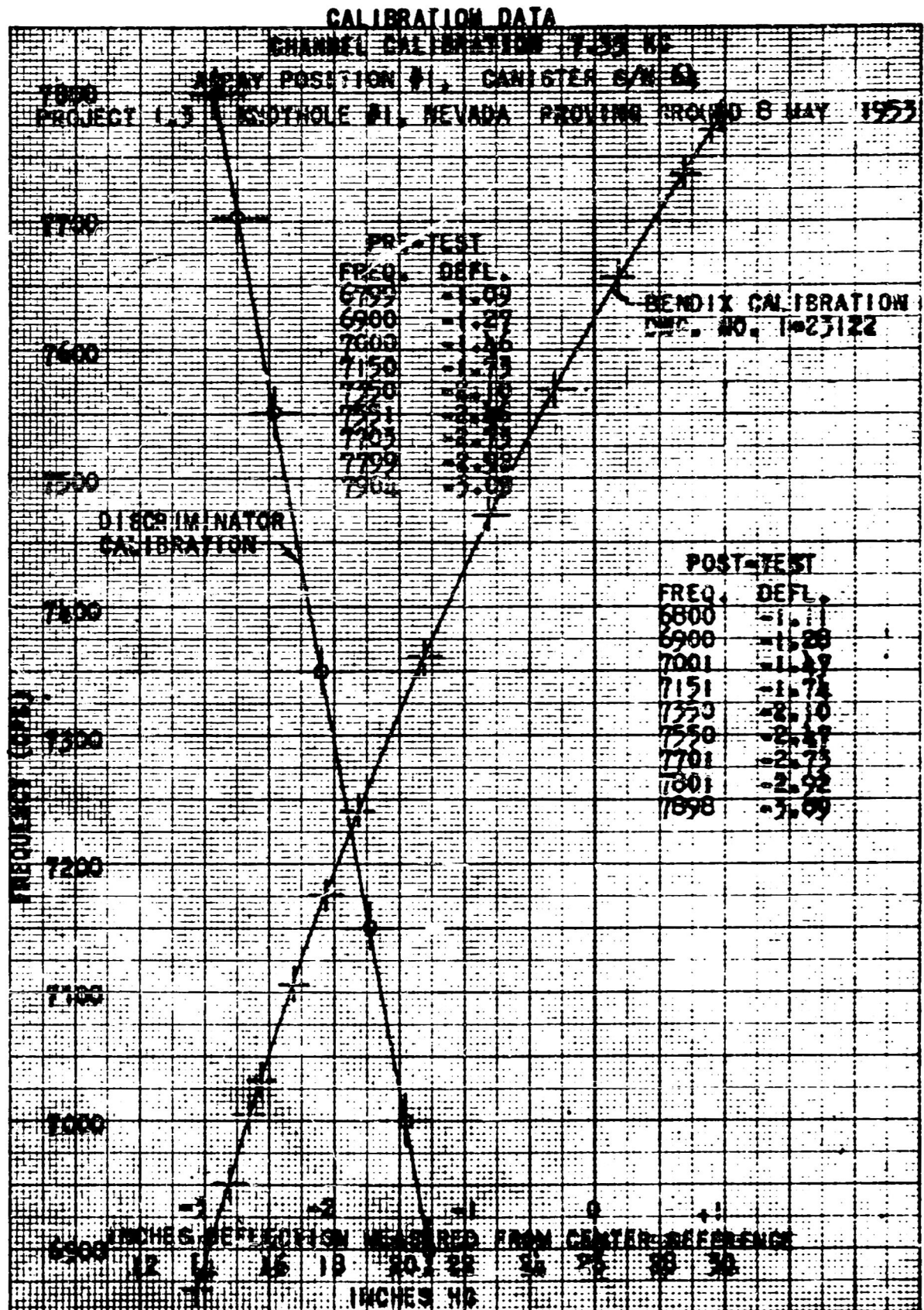


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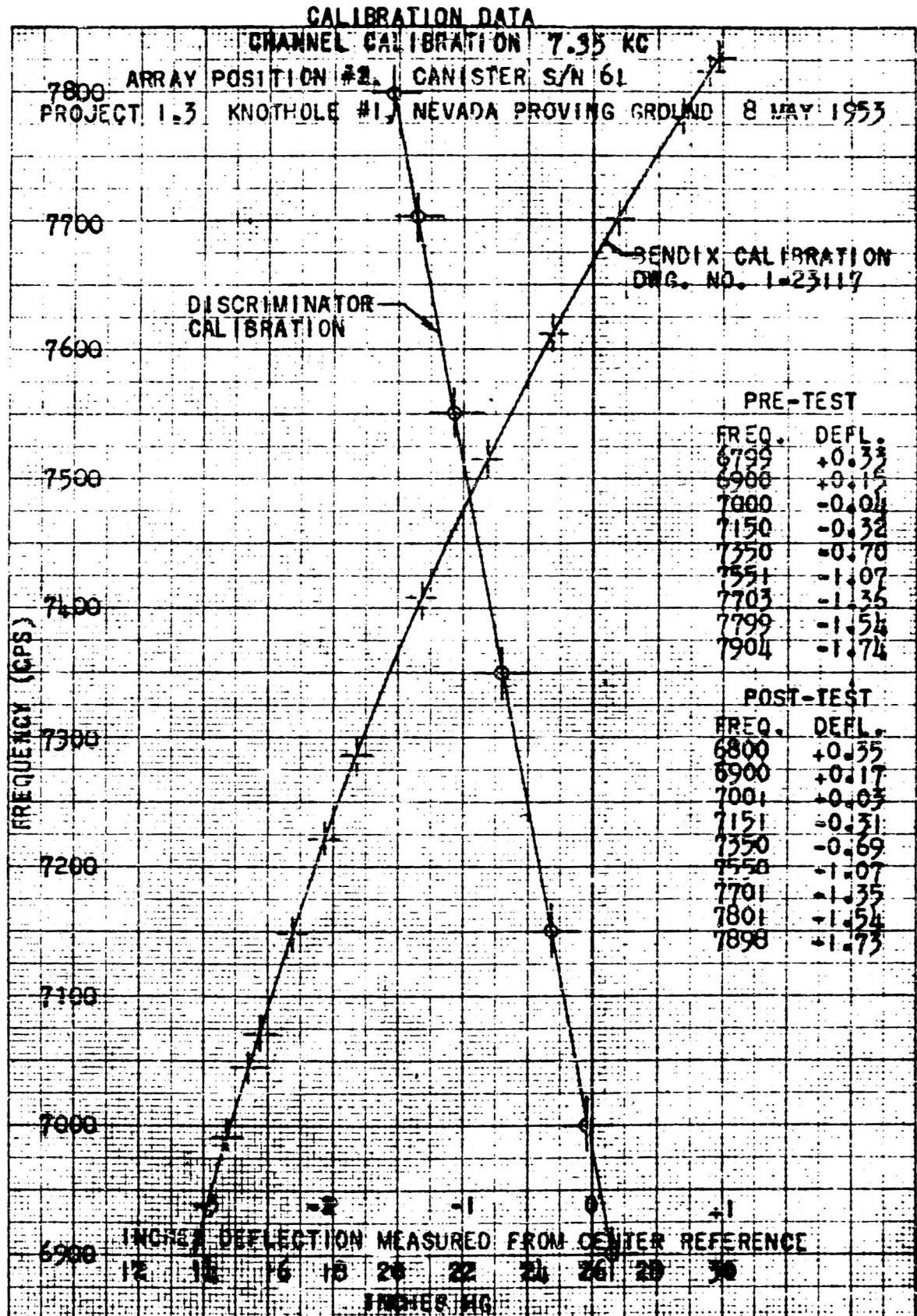


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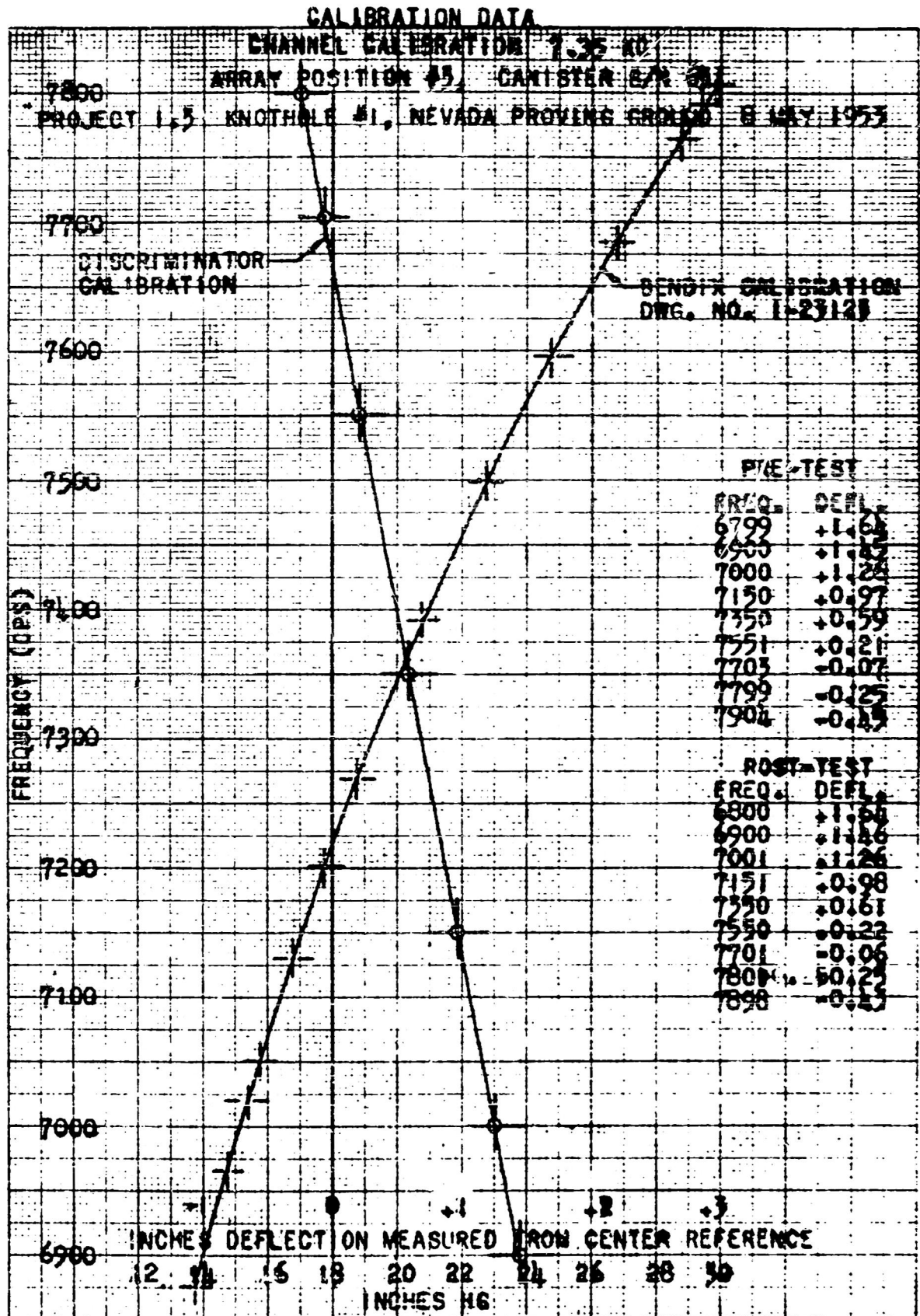


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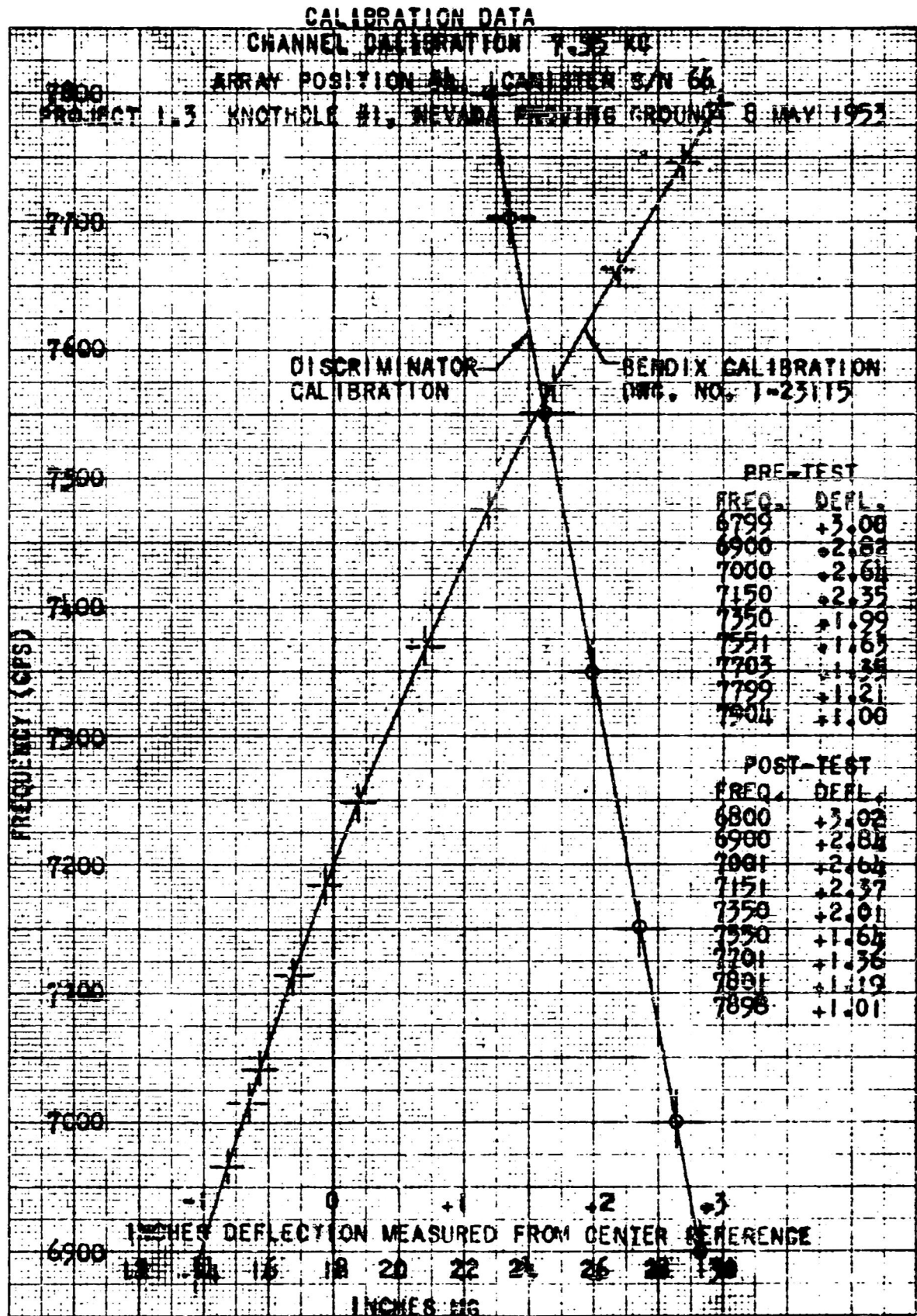


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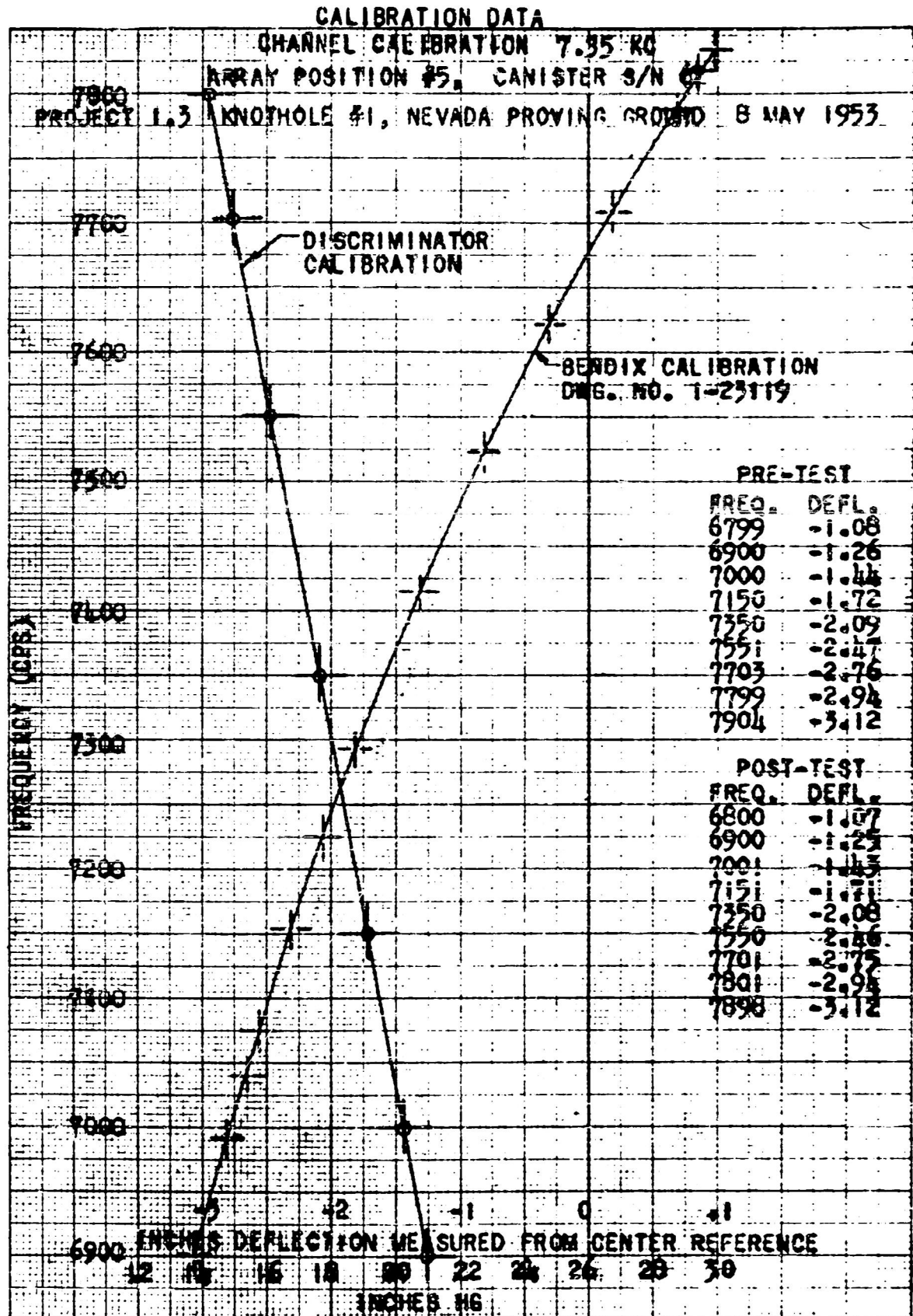


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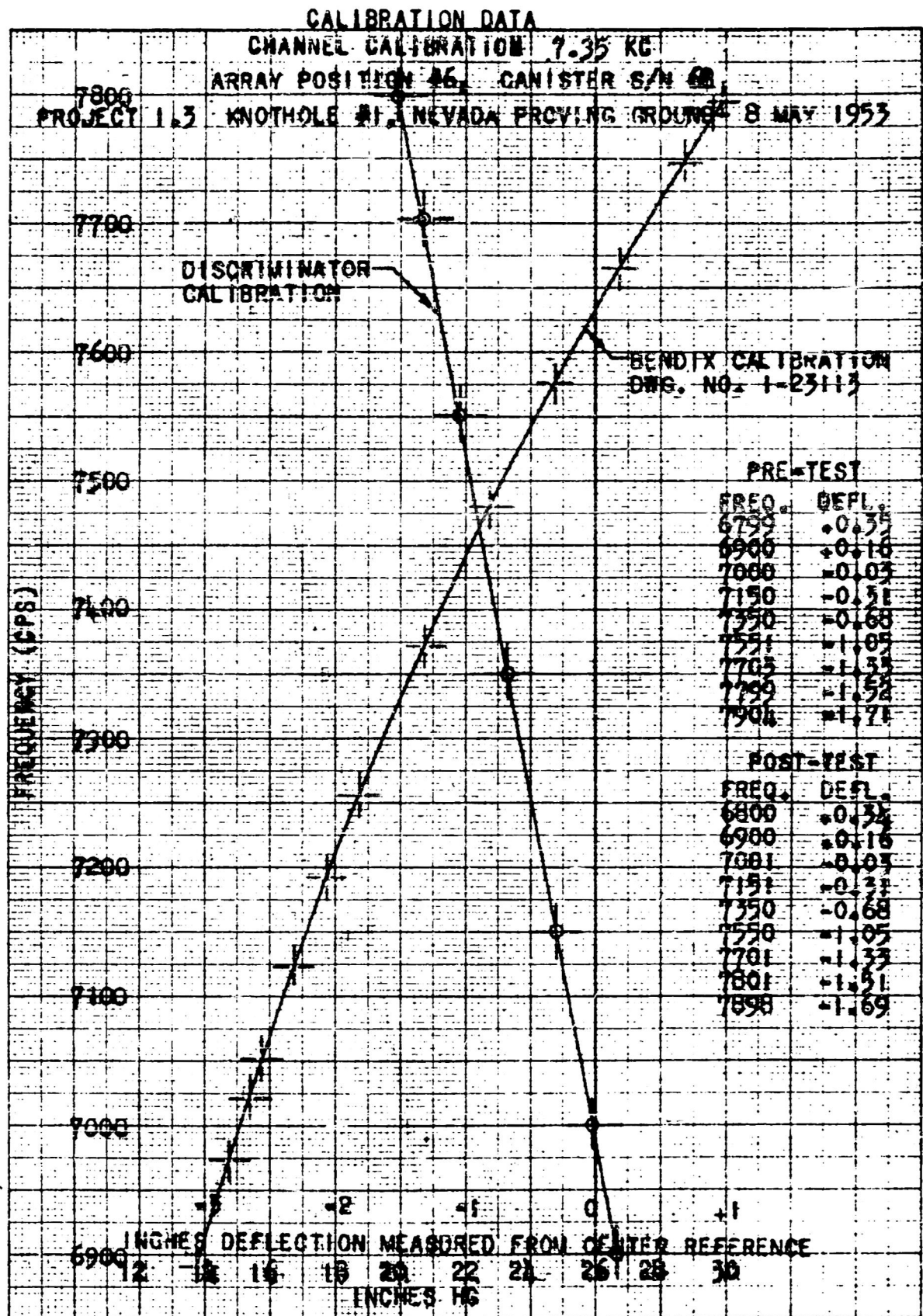


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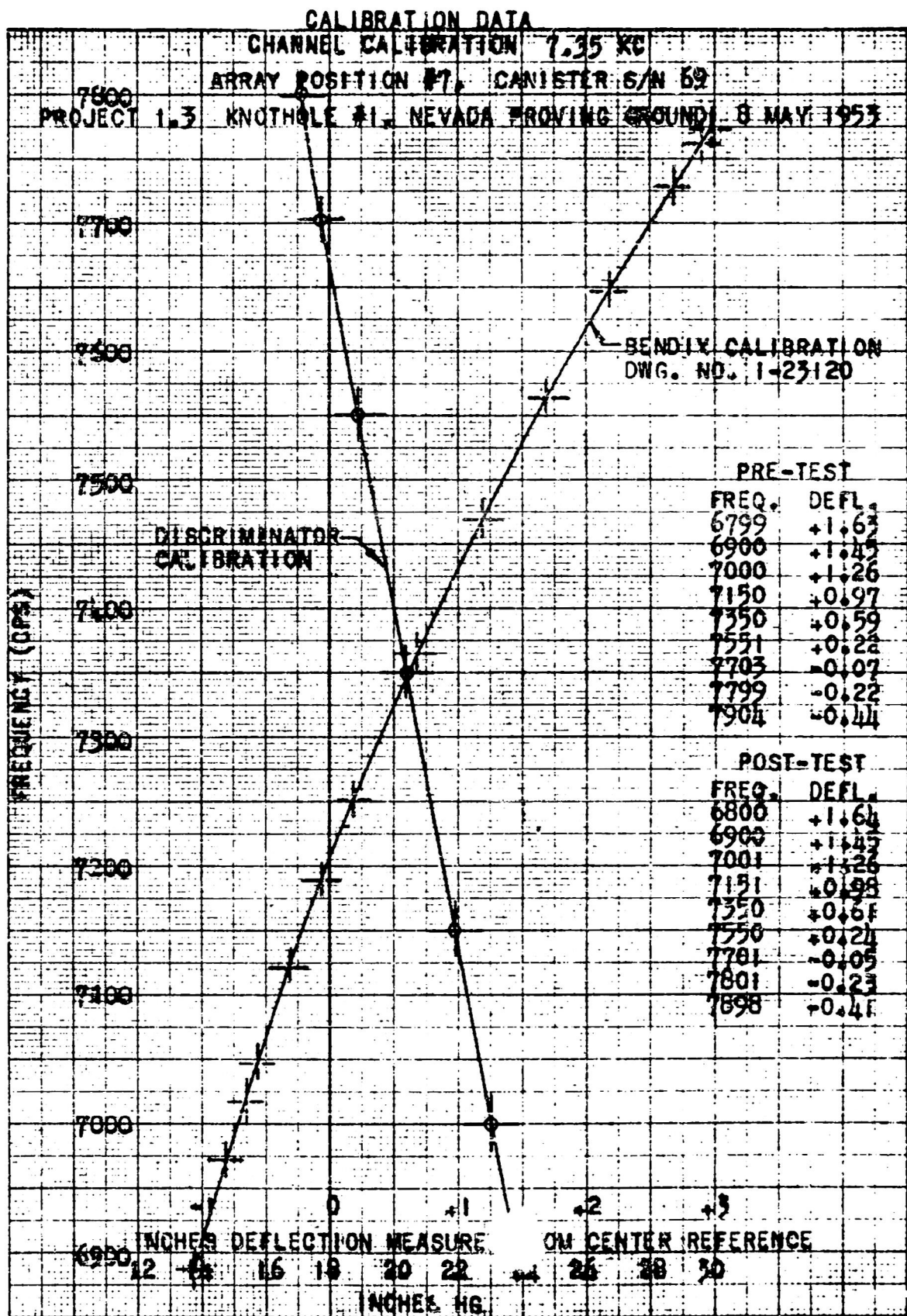


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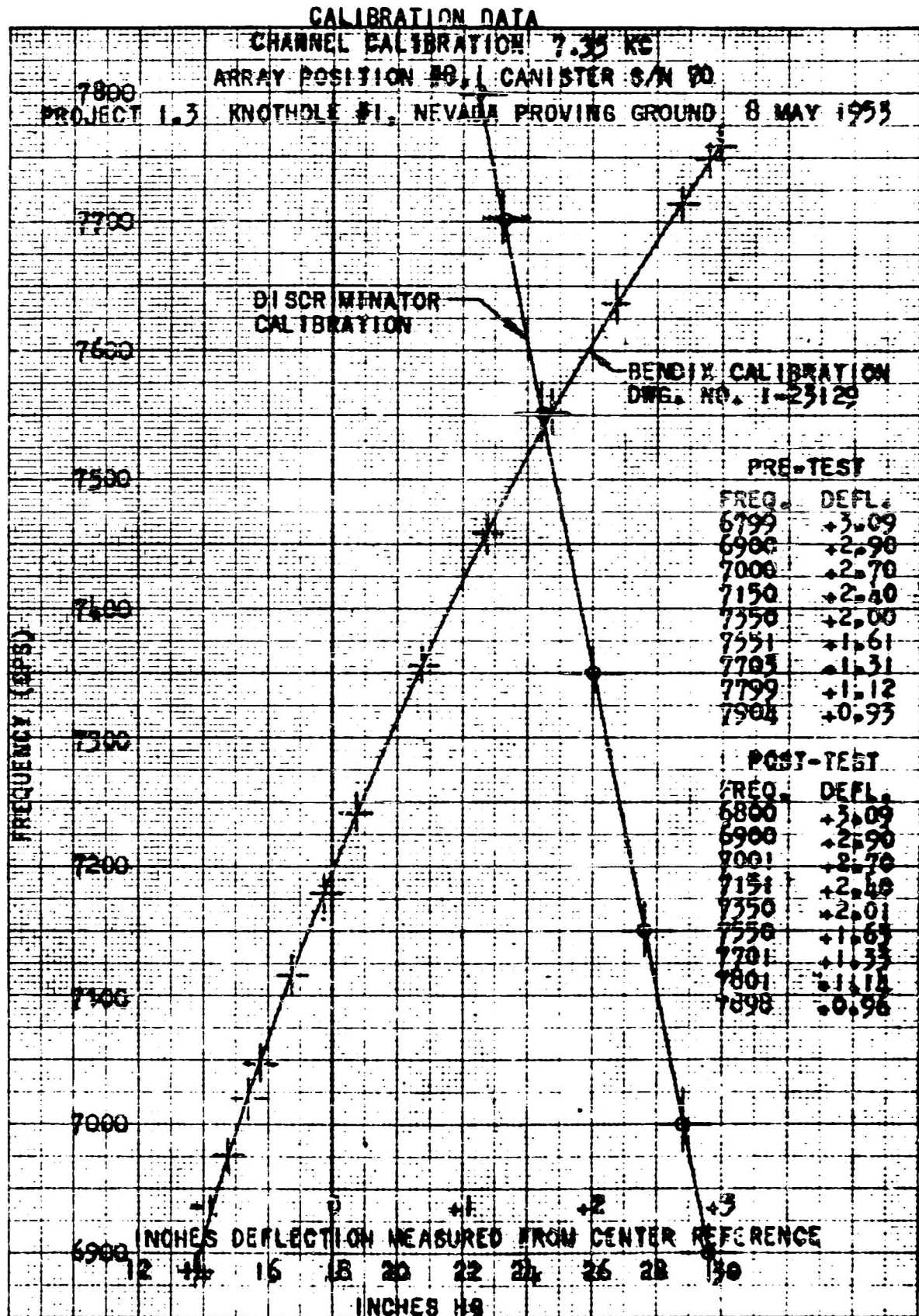


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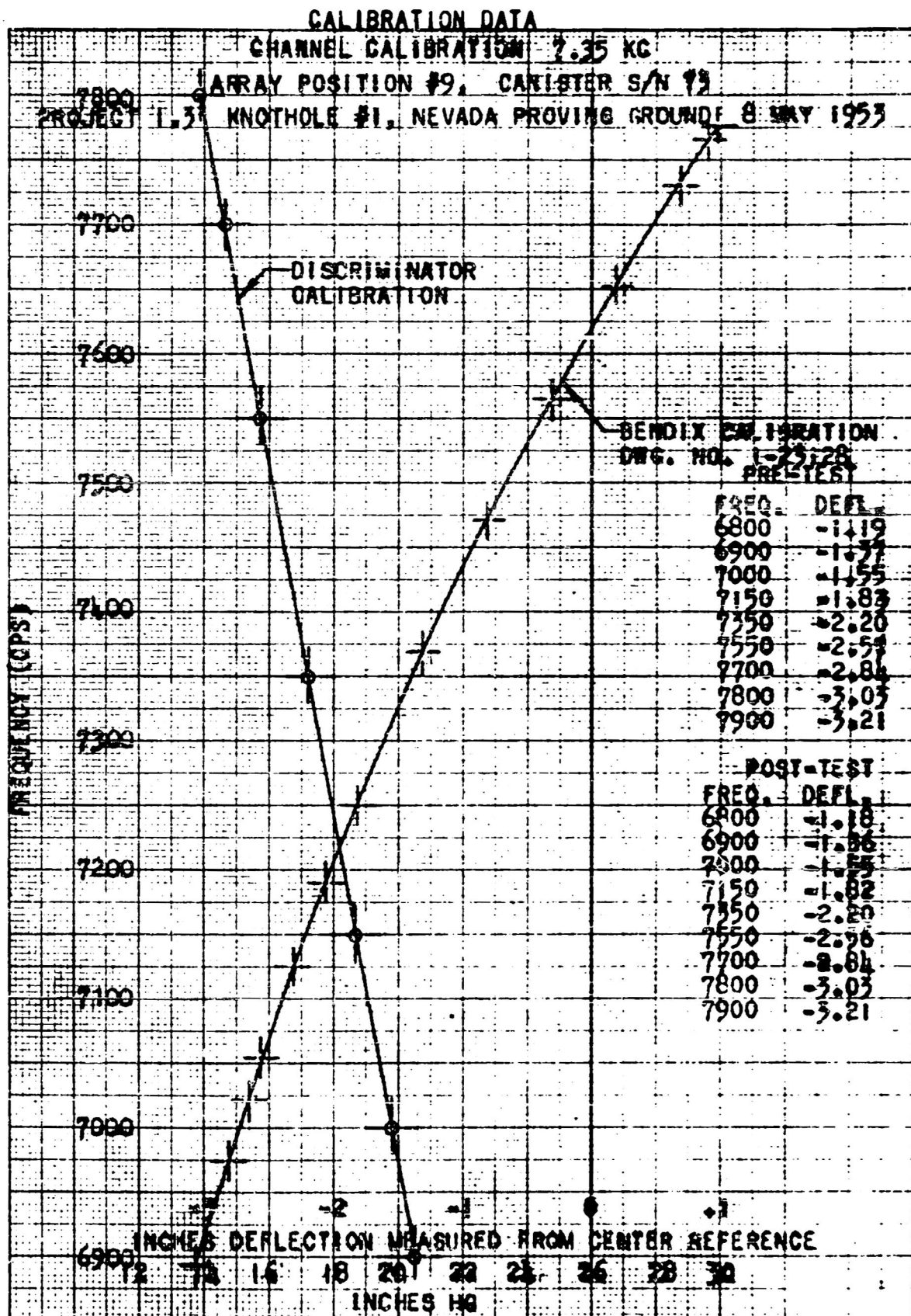


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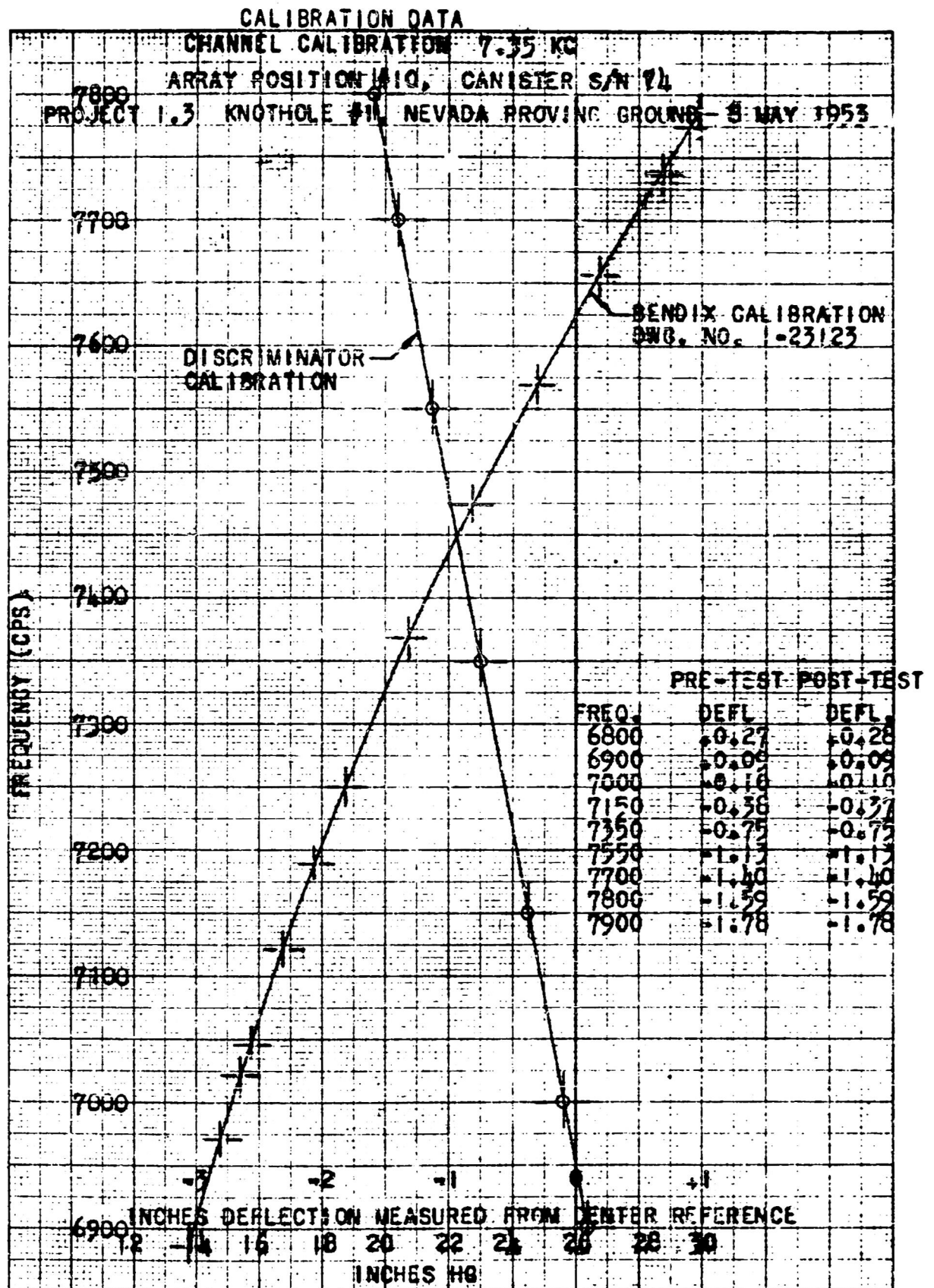


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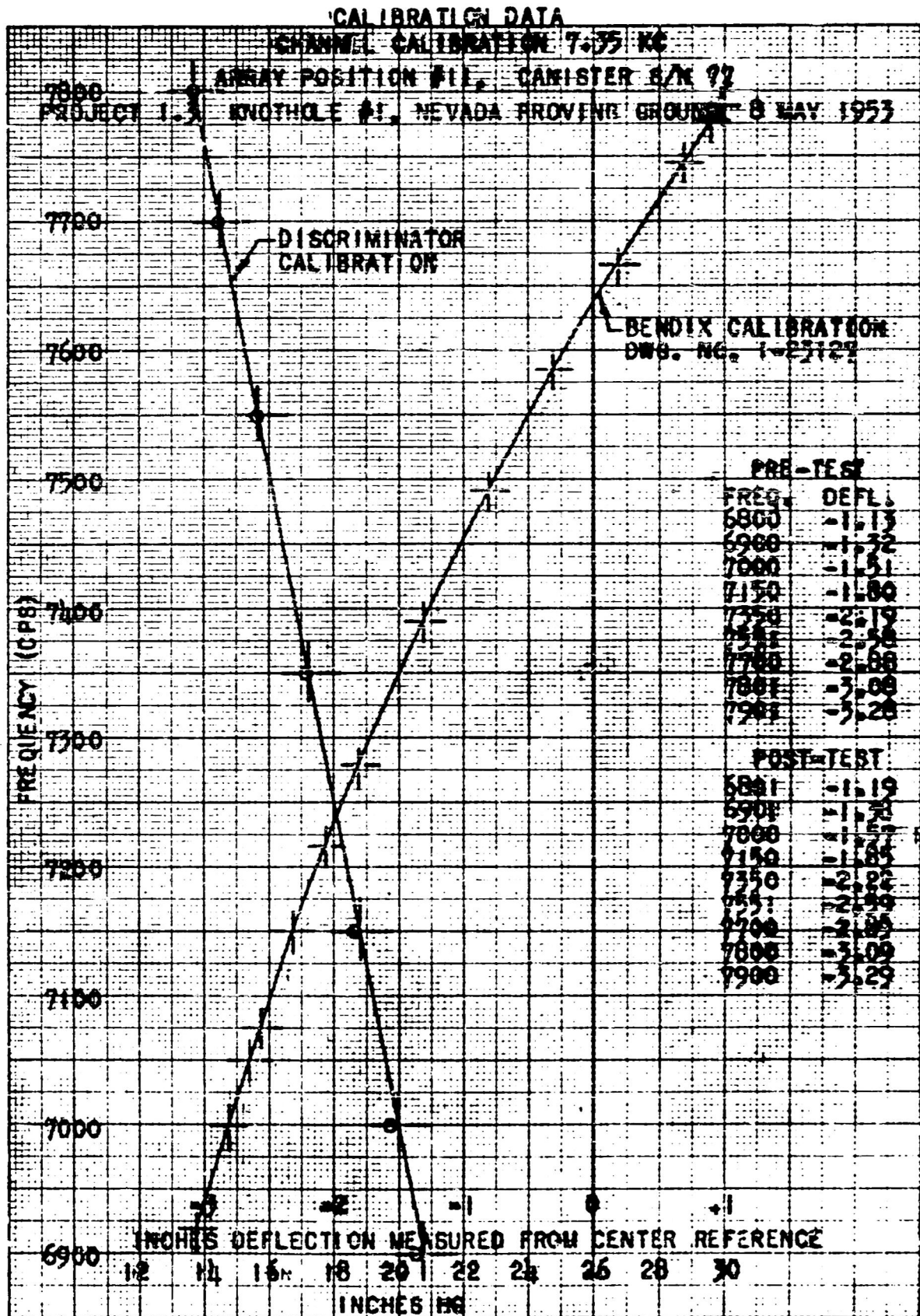


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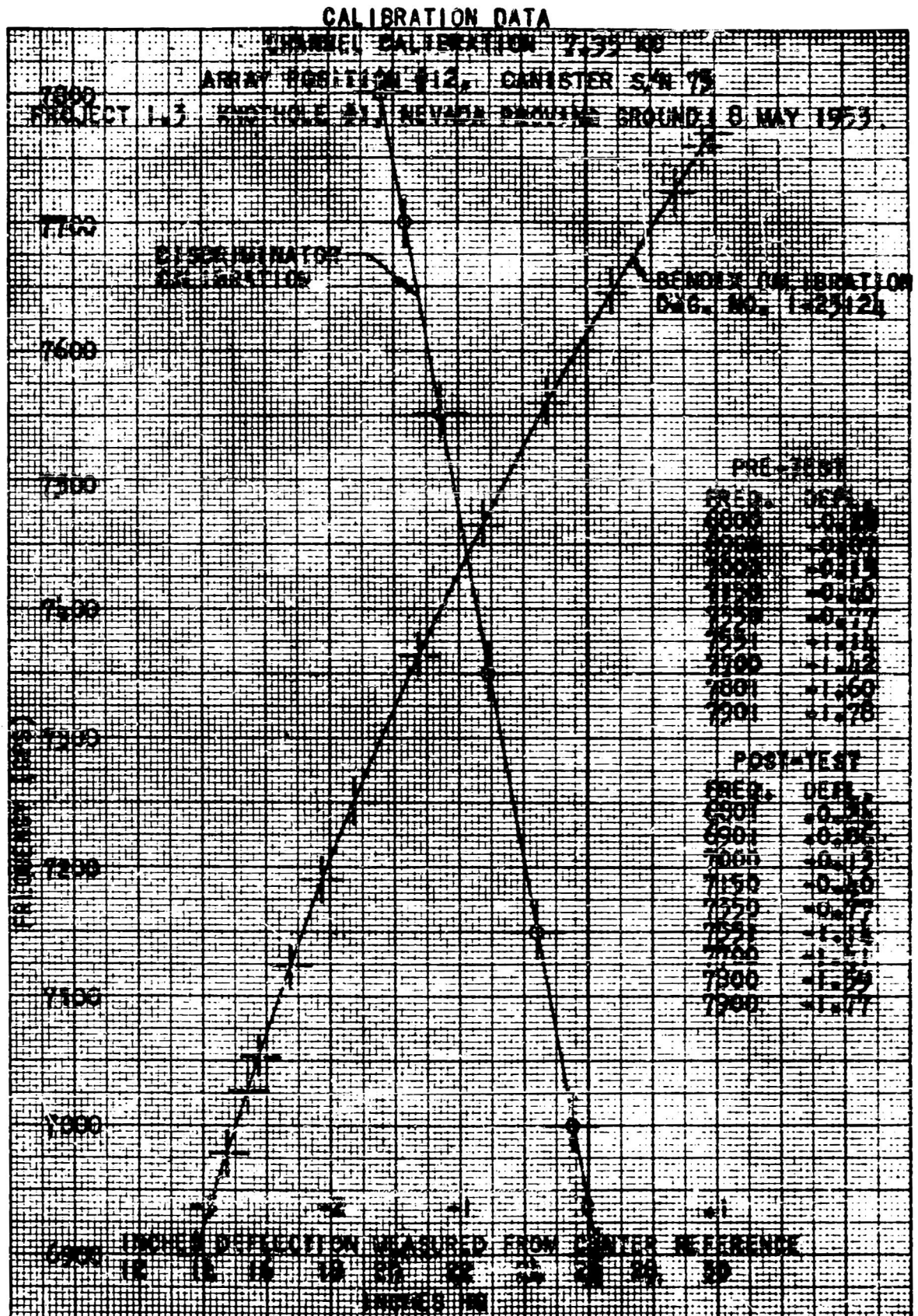


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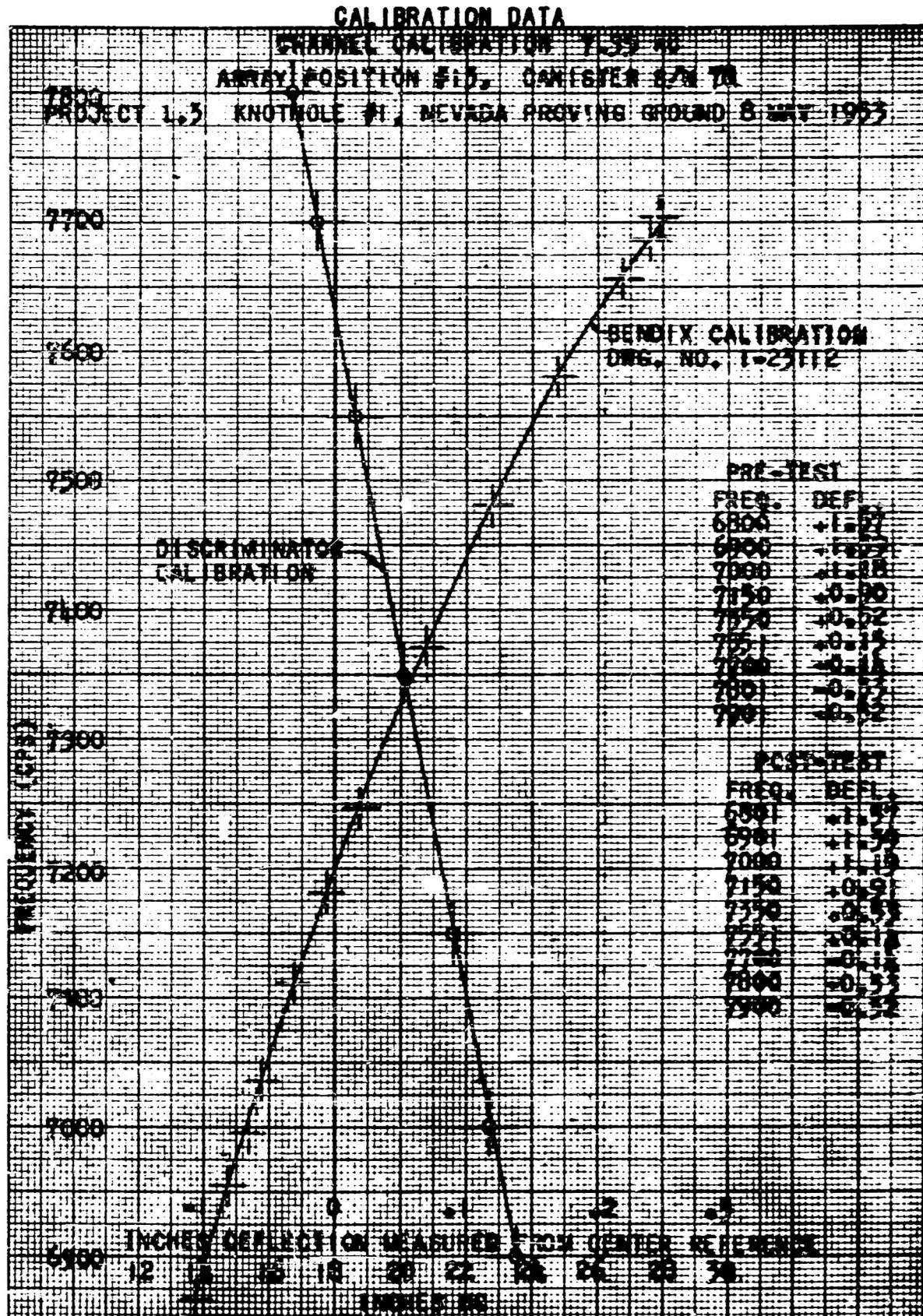


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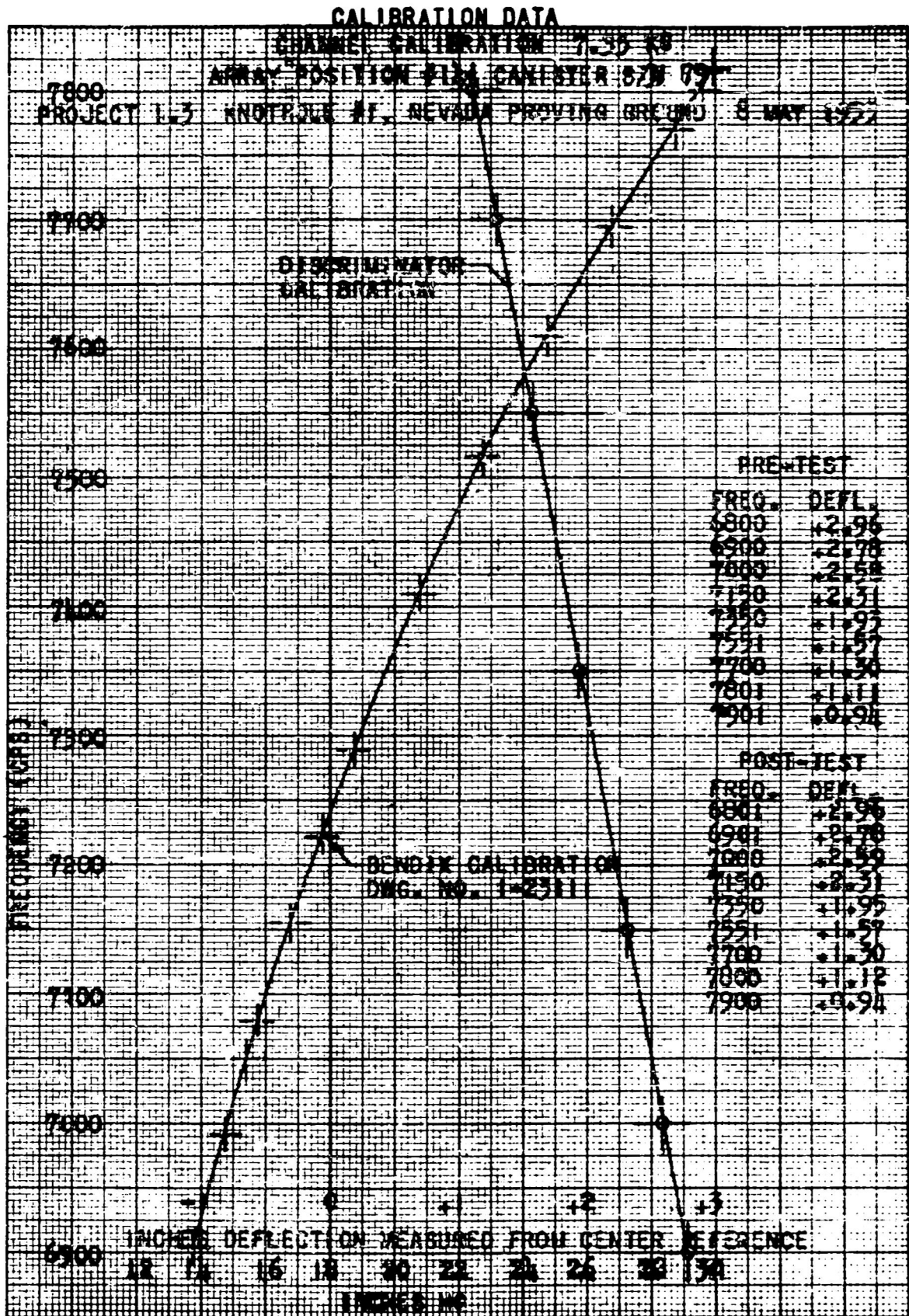


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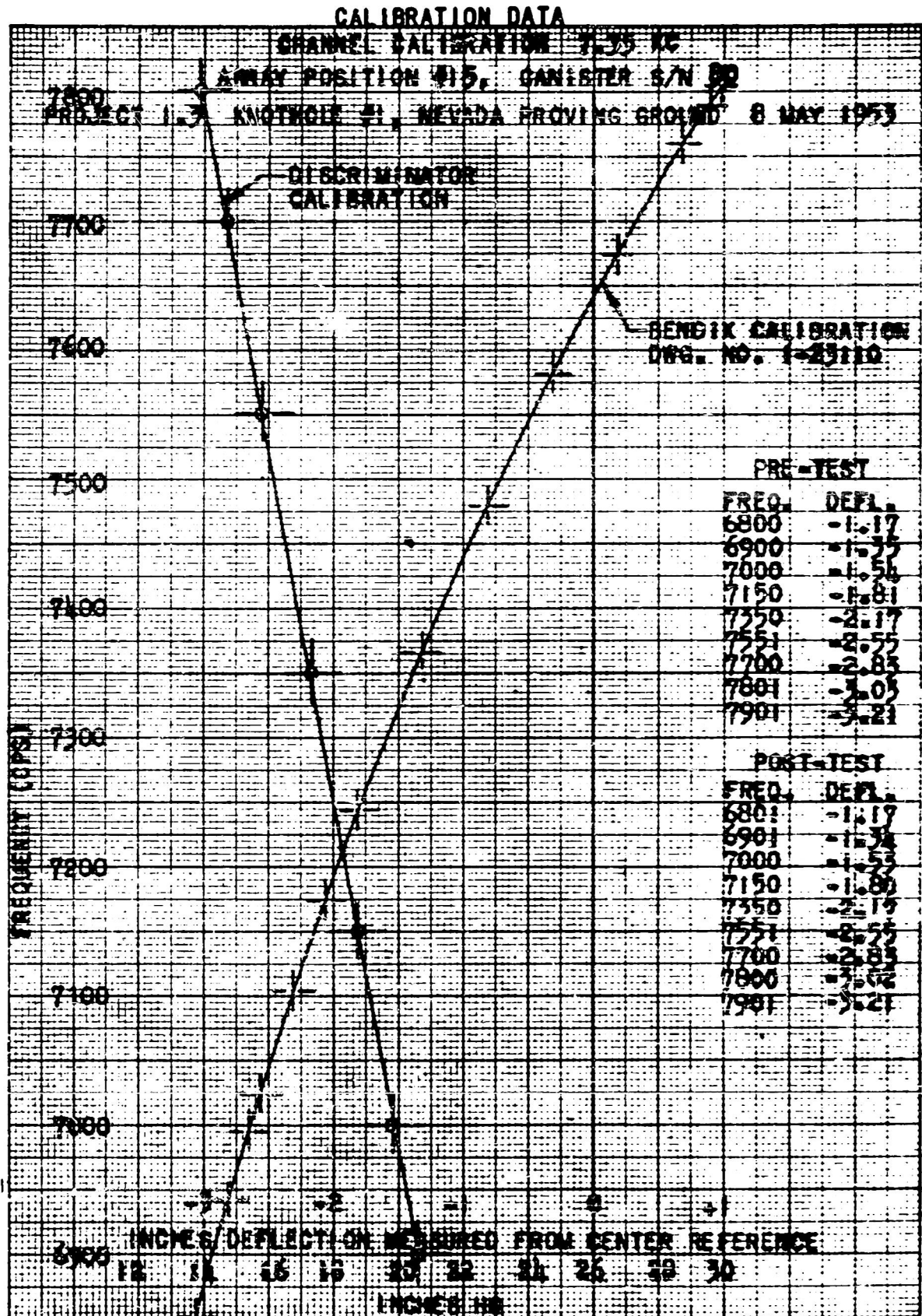


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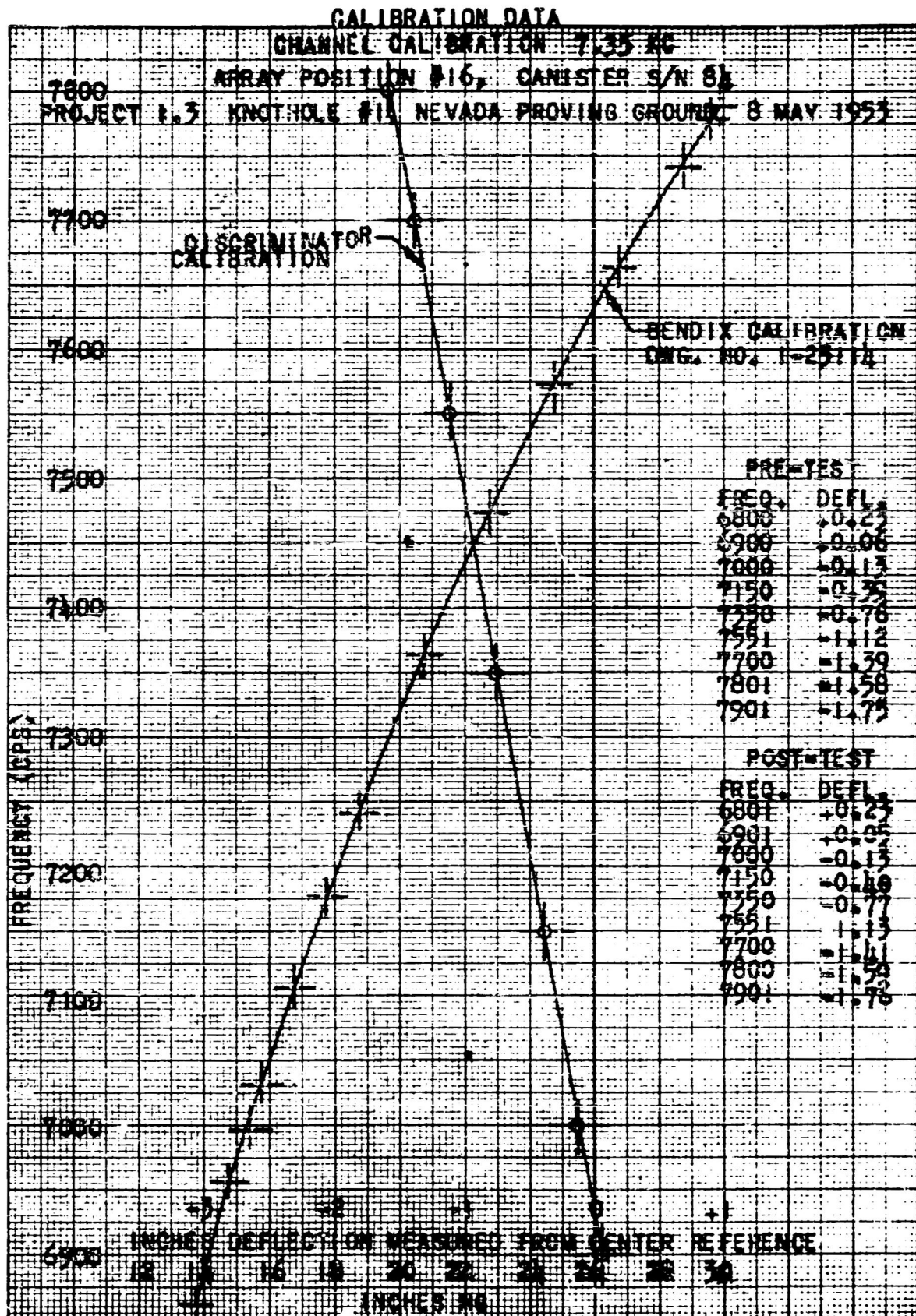


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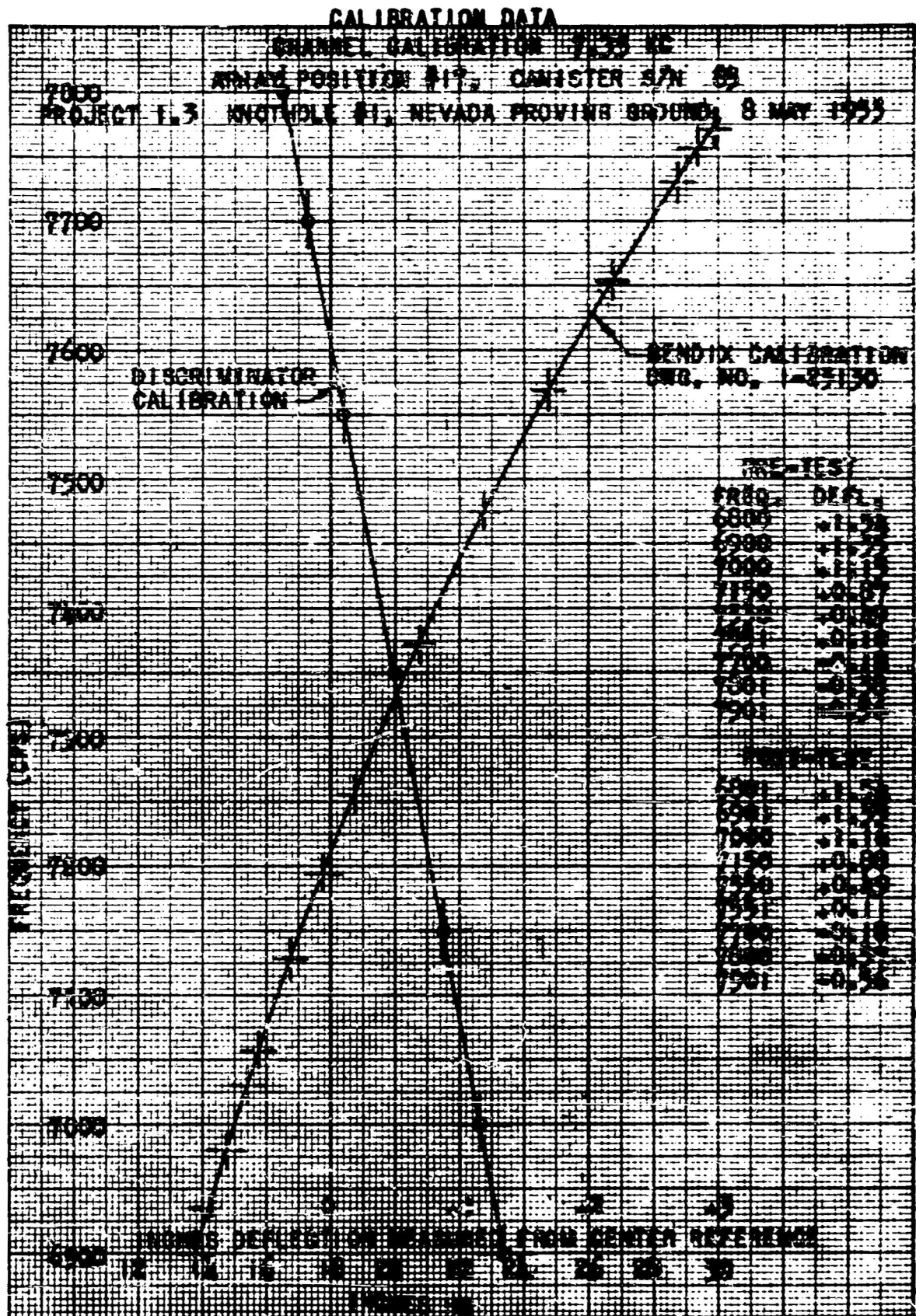


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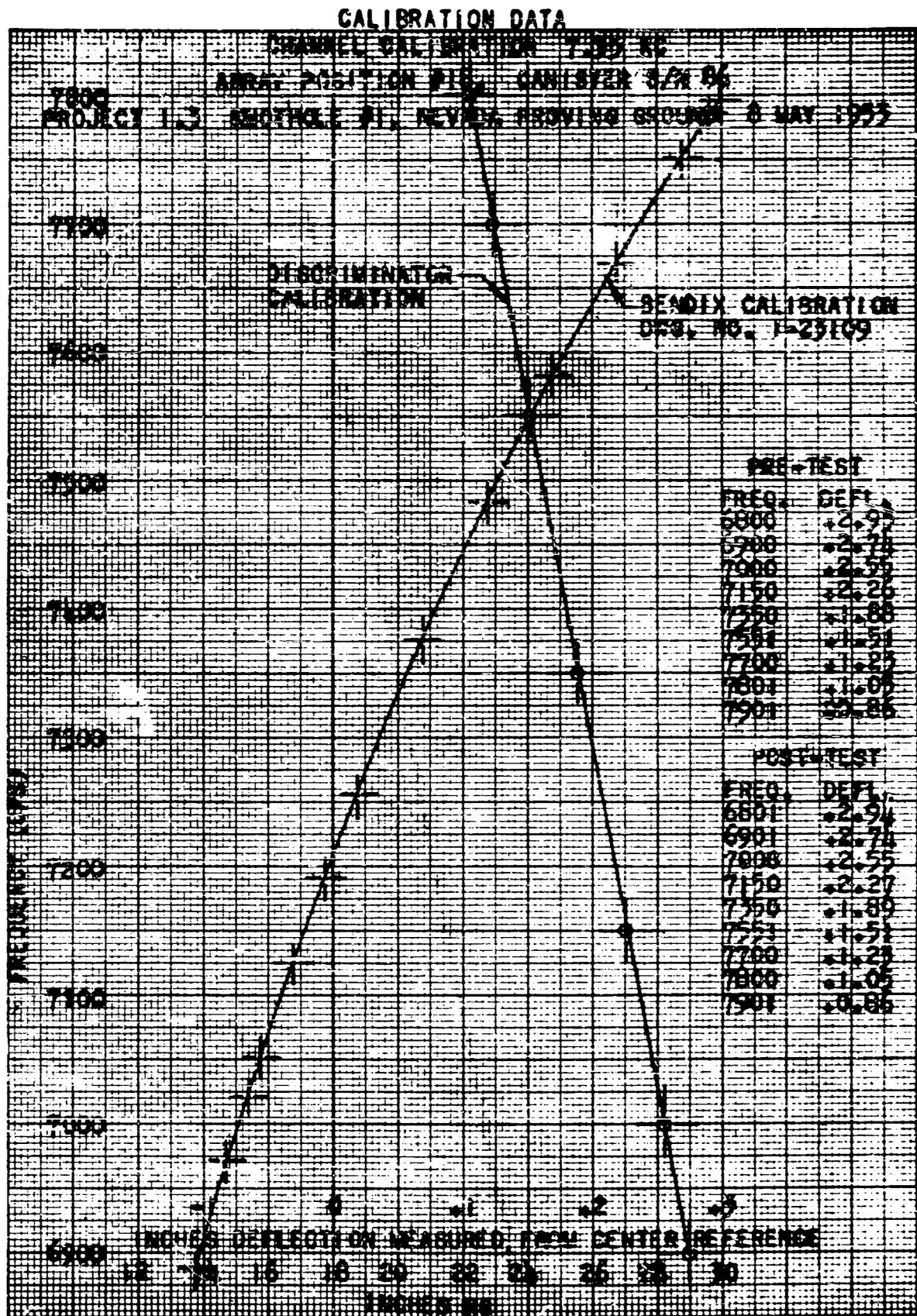


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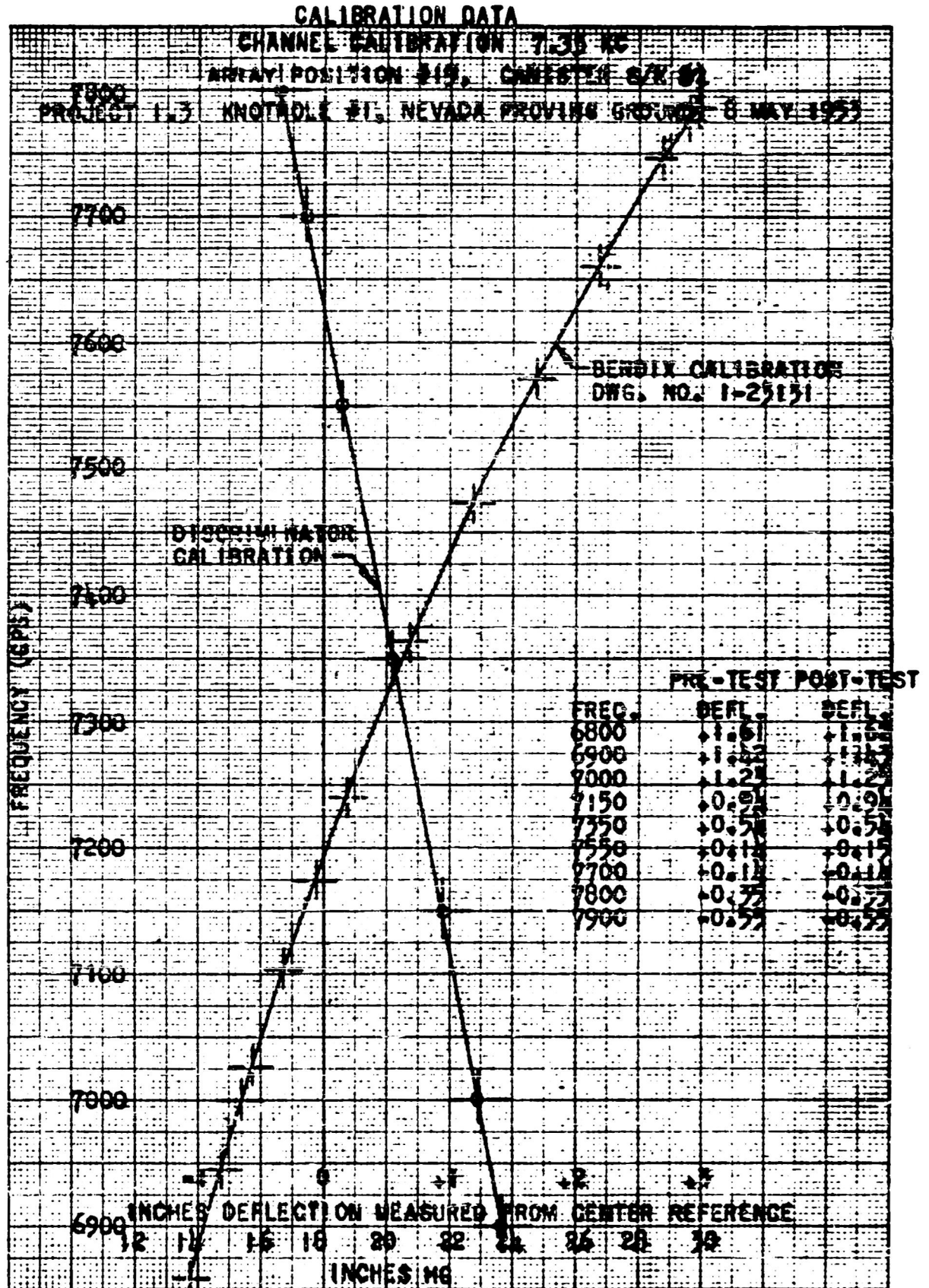


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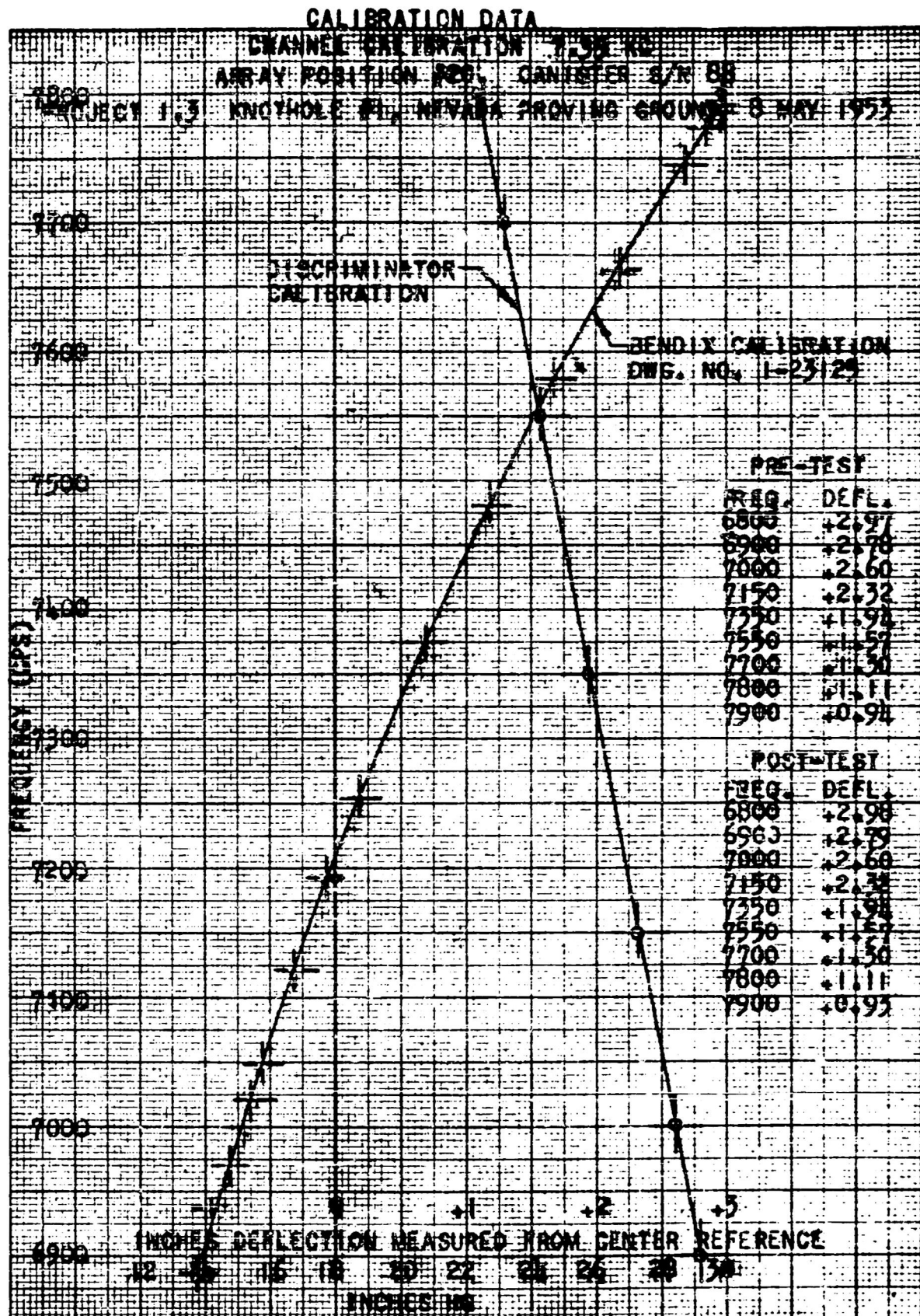


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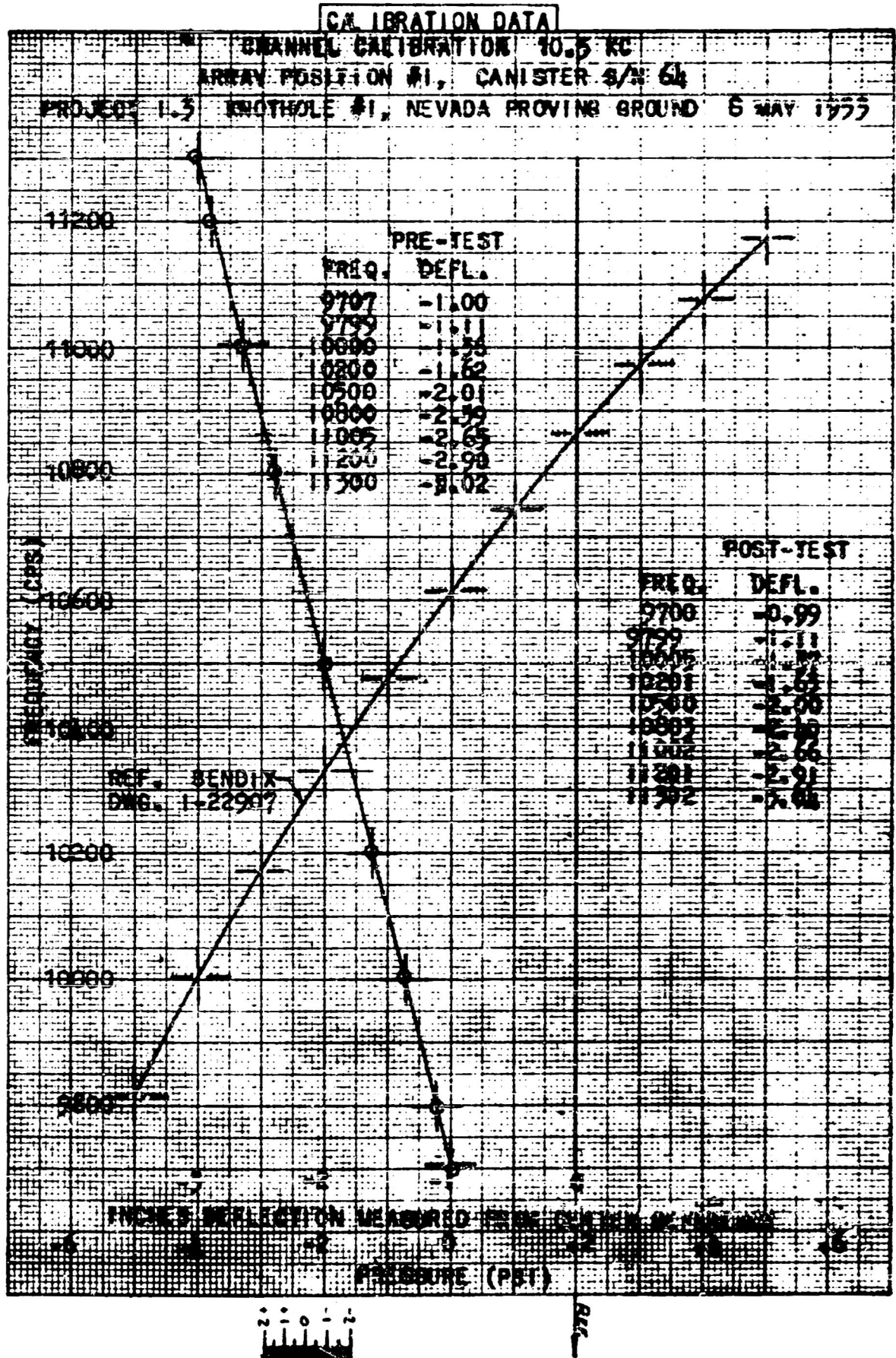


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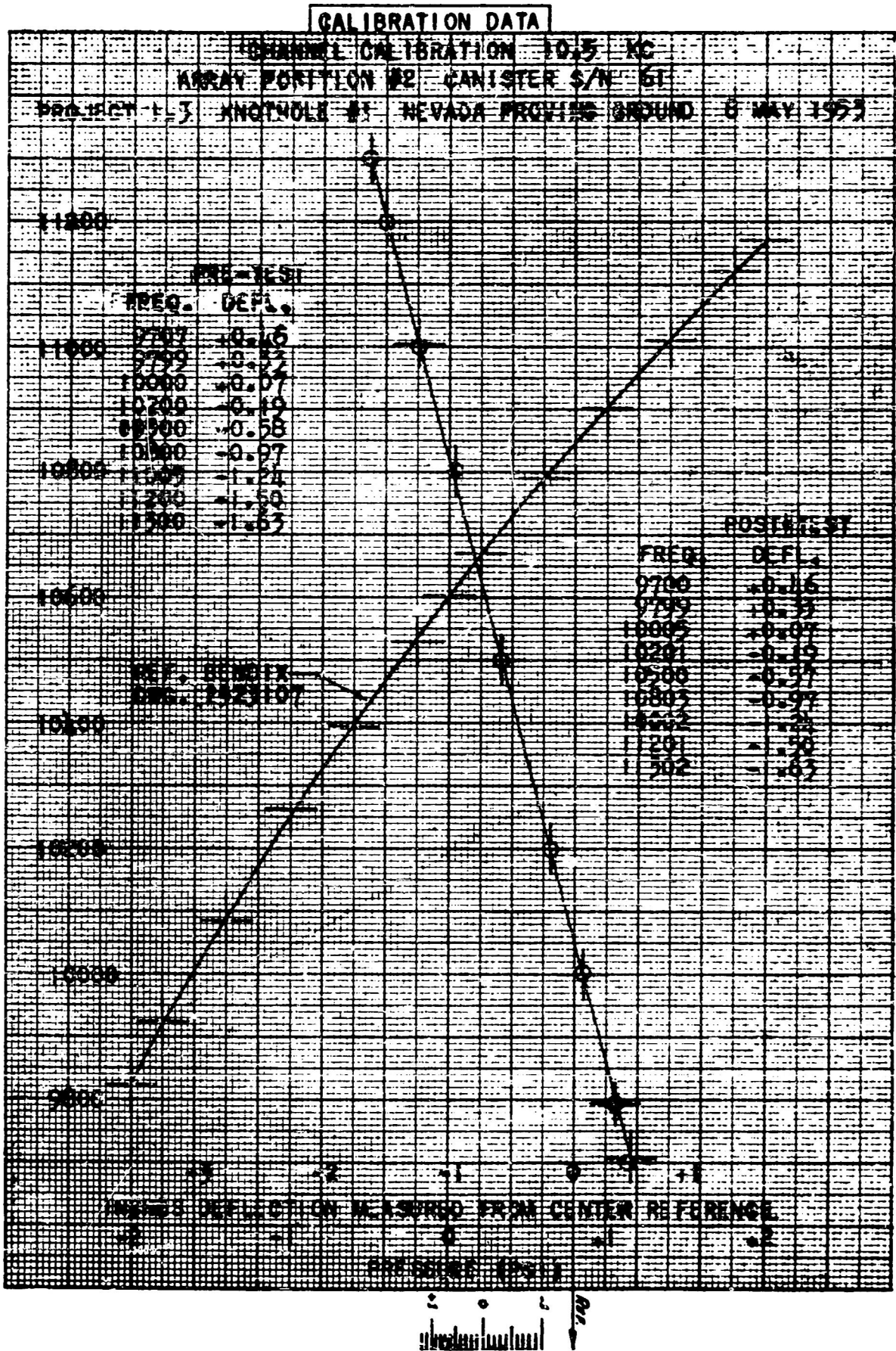


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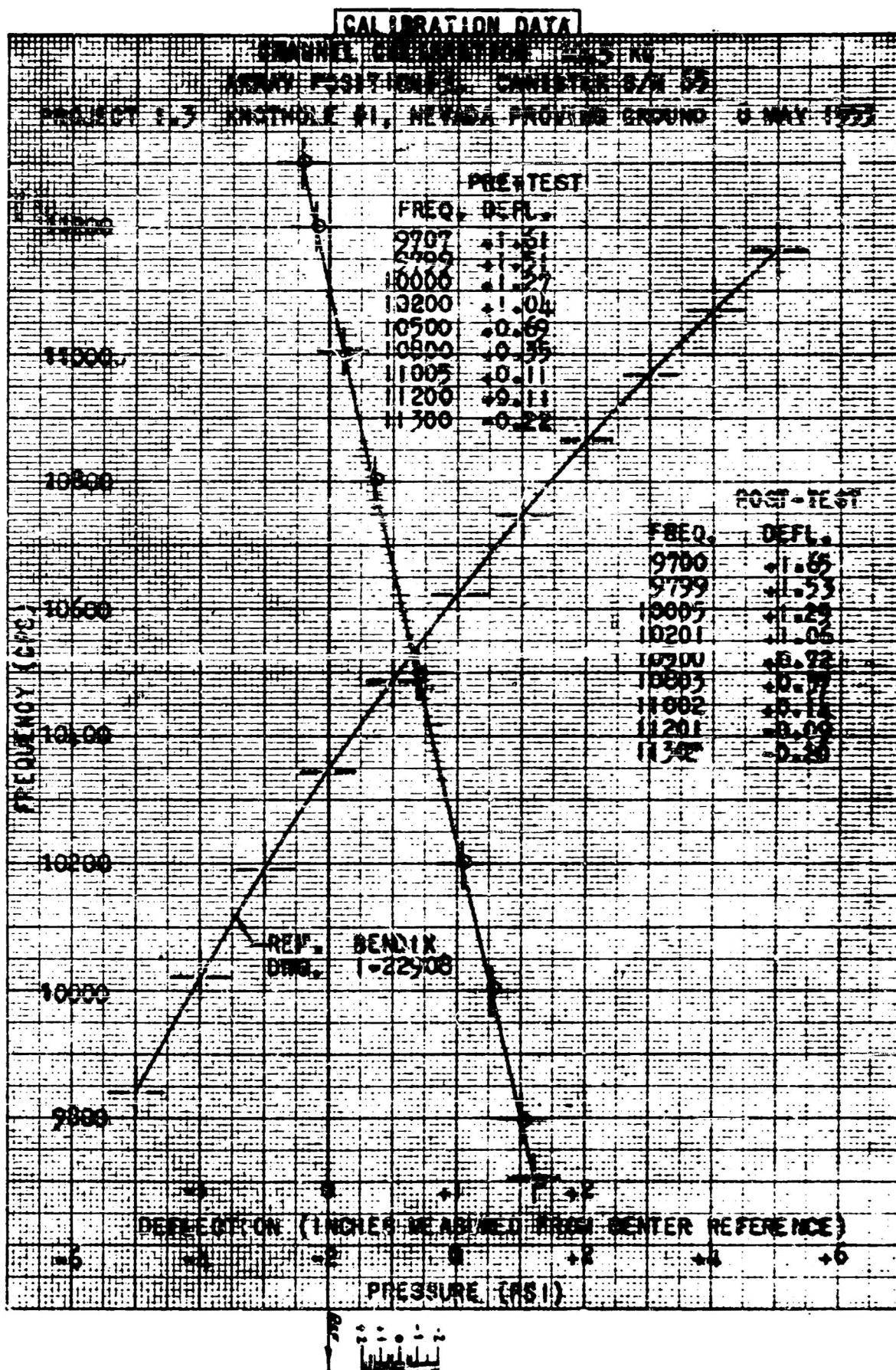


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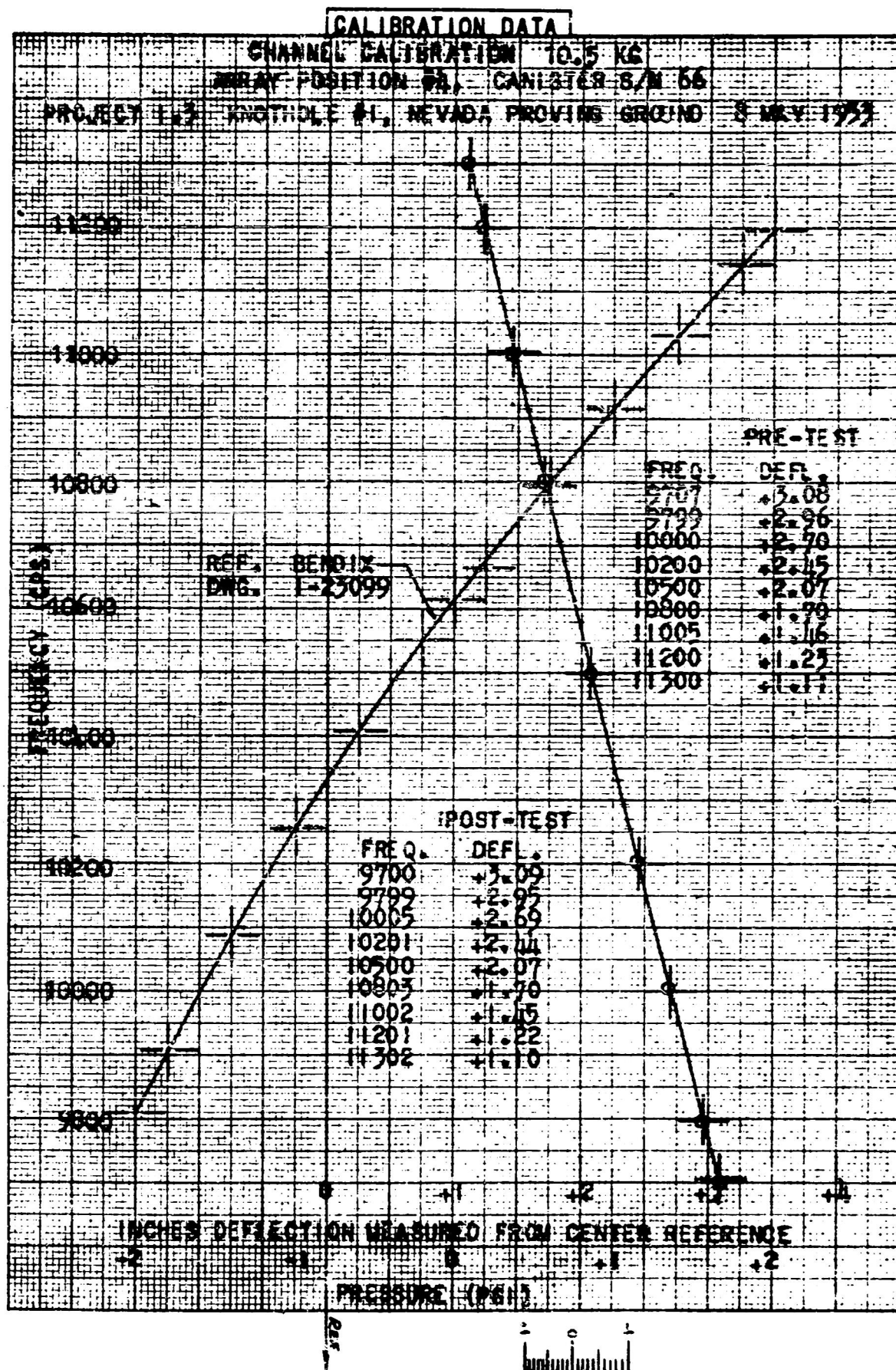


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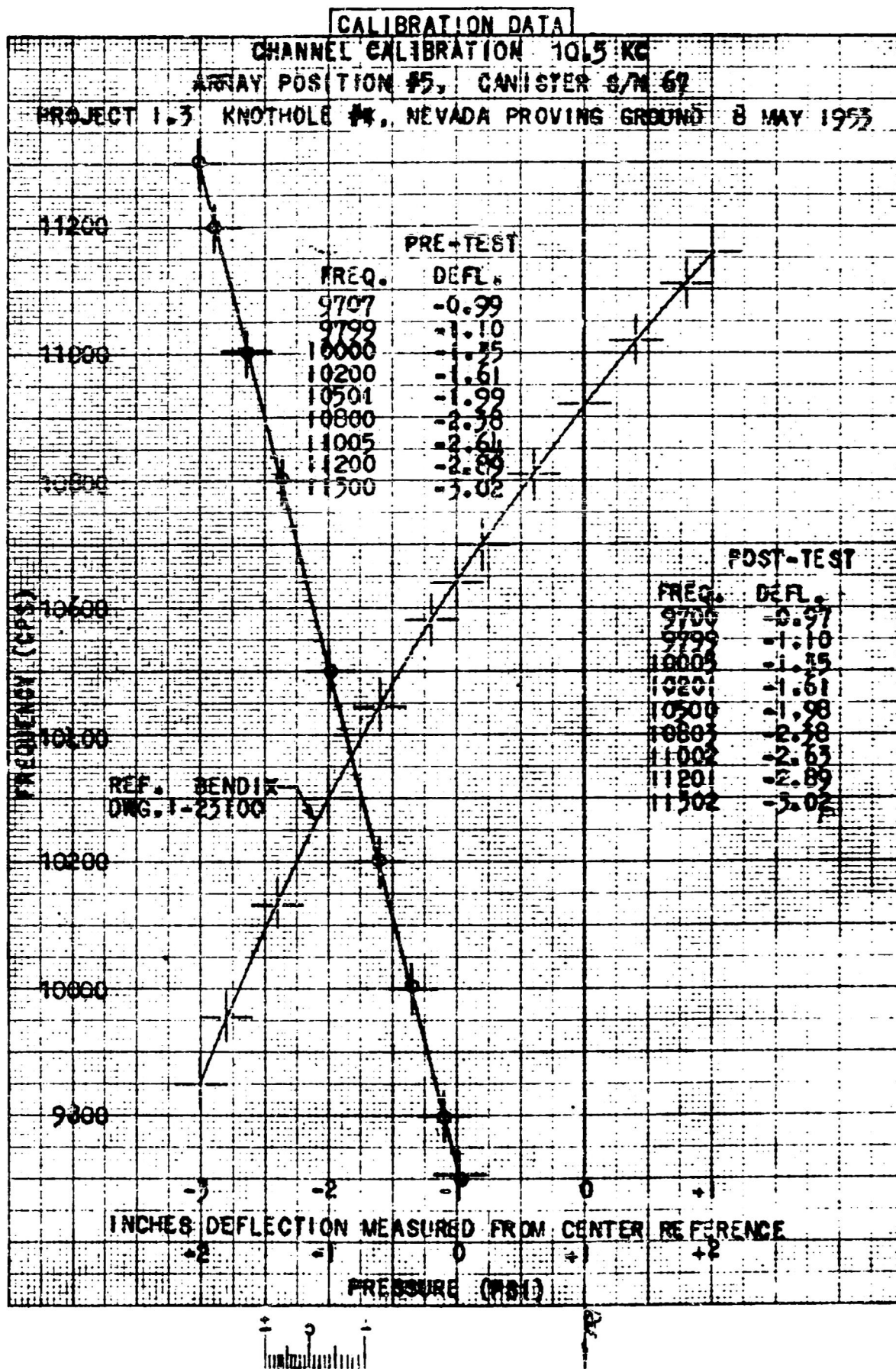


Figure 71

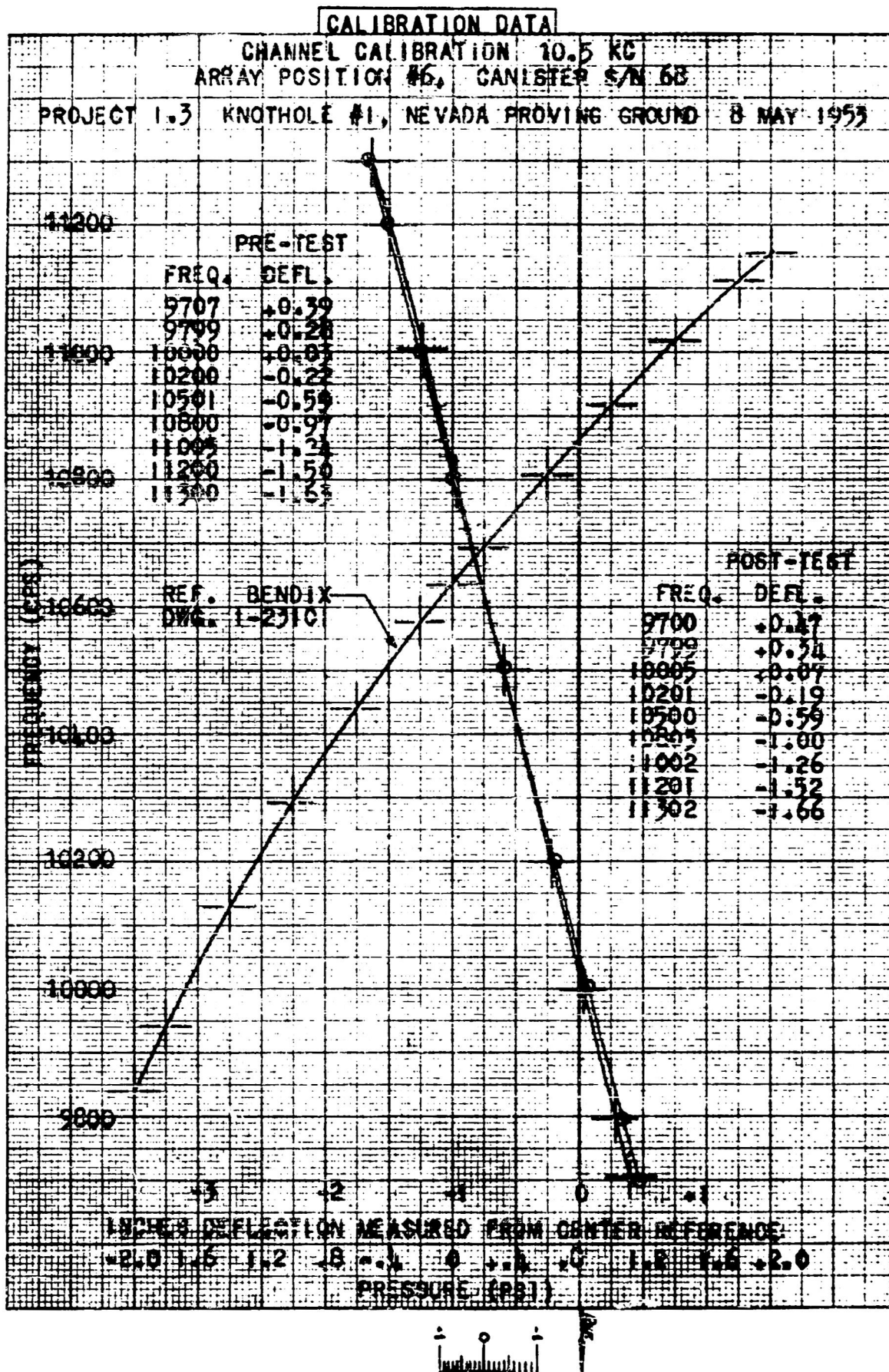
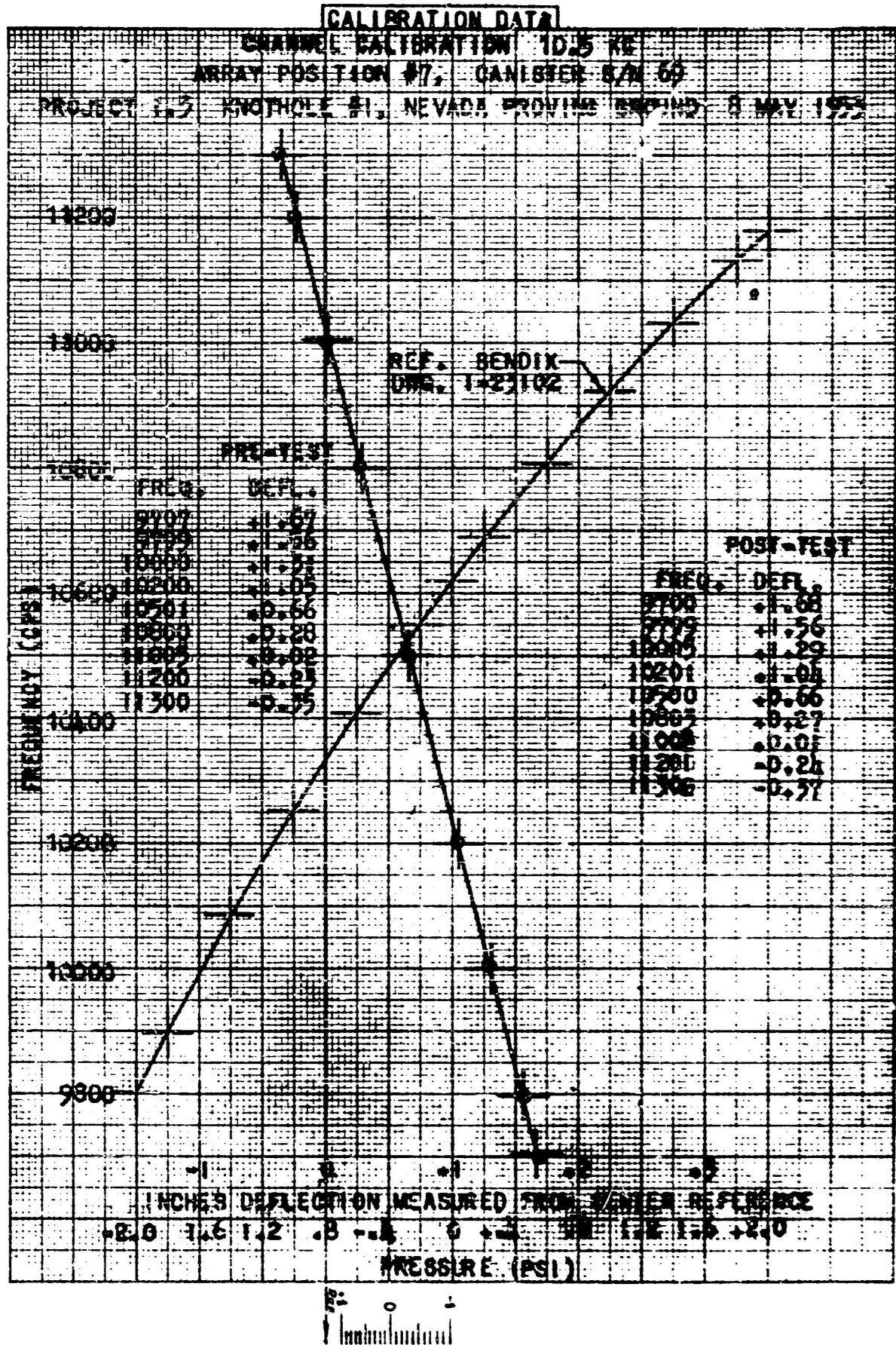


Figure 72

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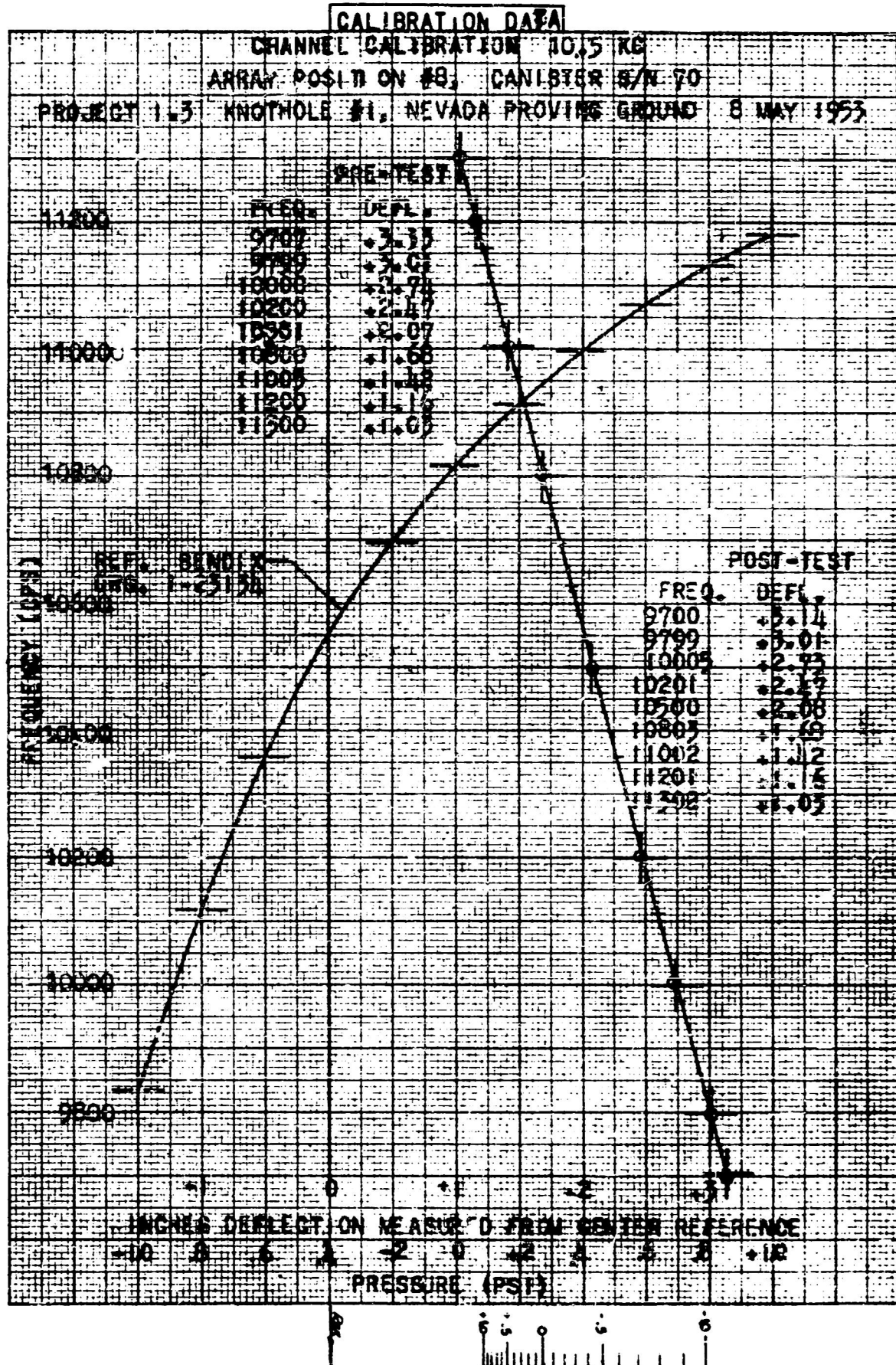


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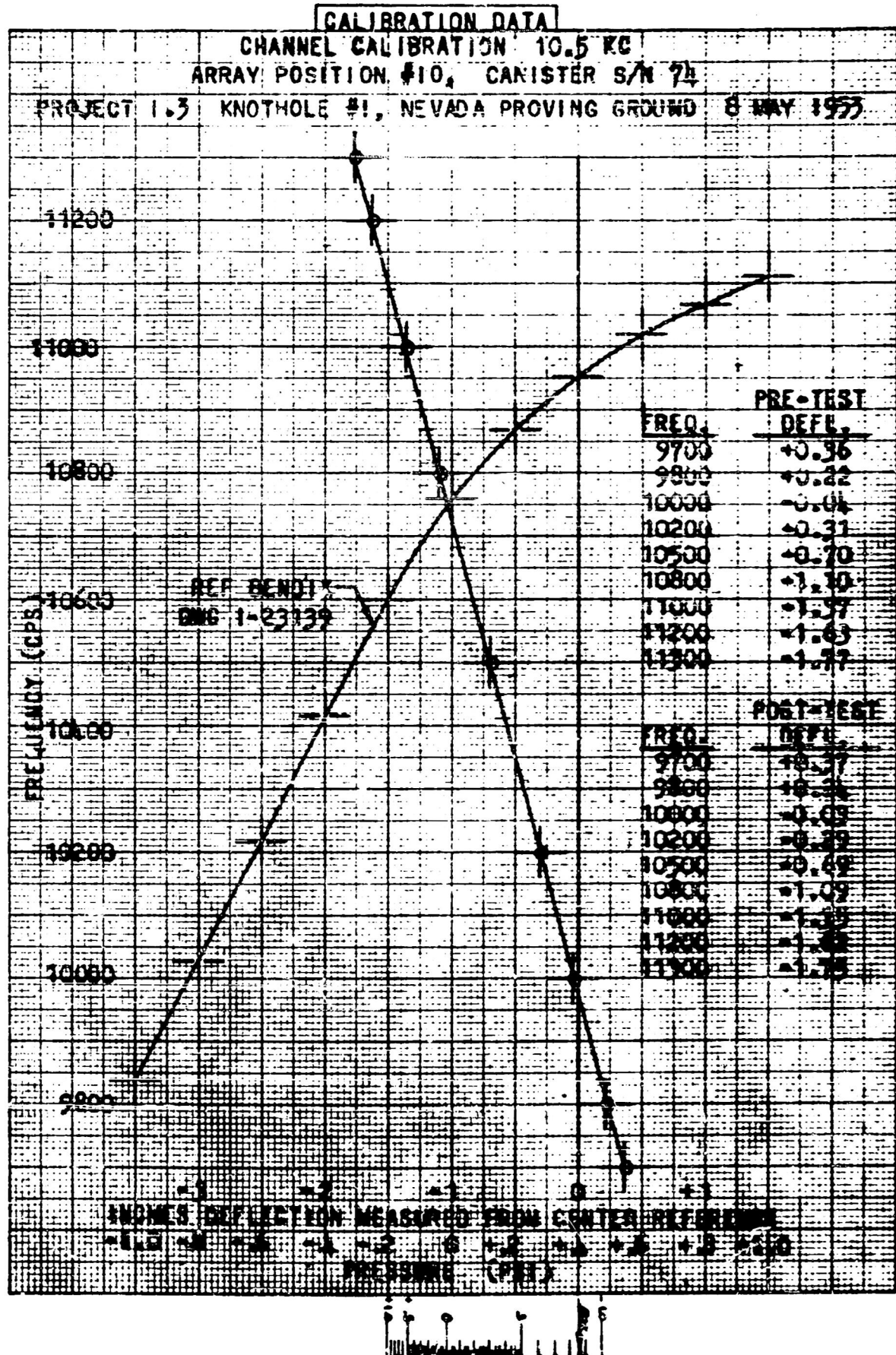


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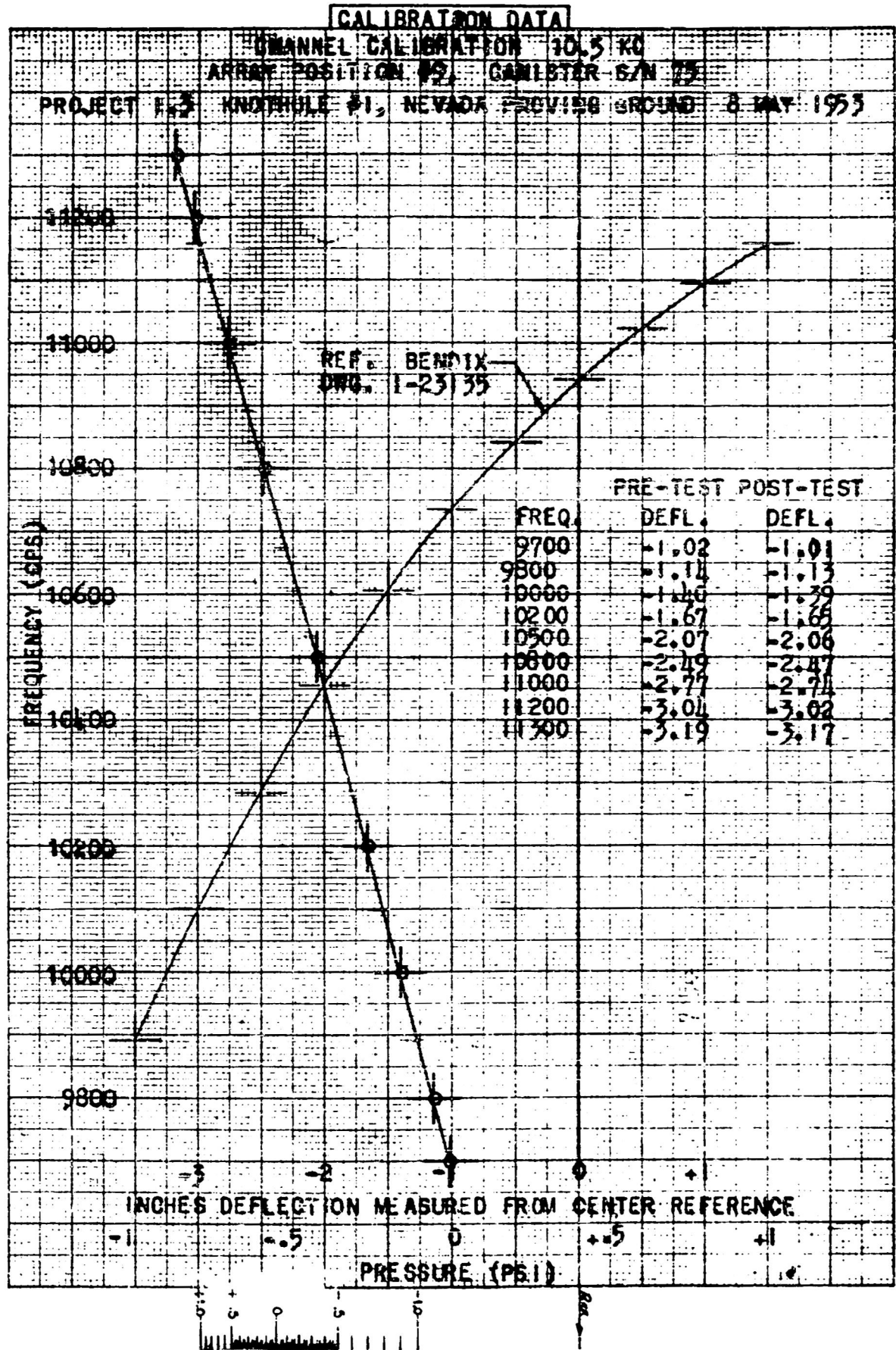


Figure 76

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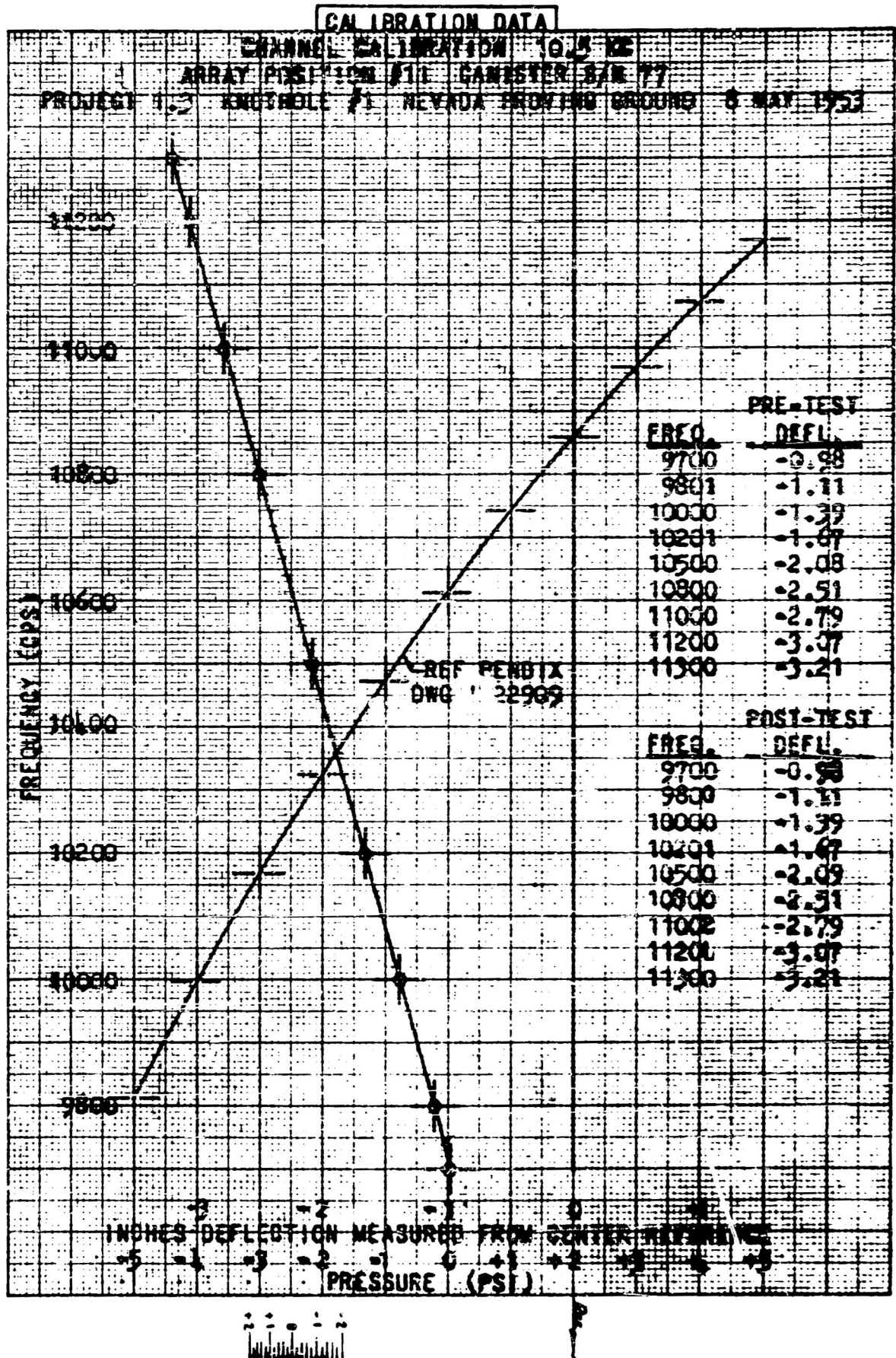


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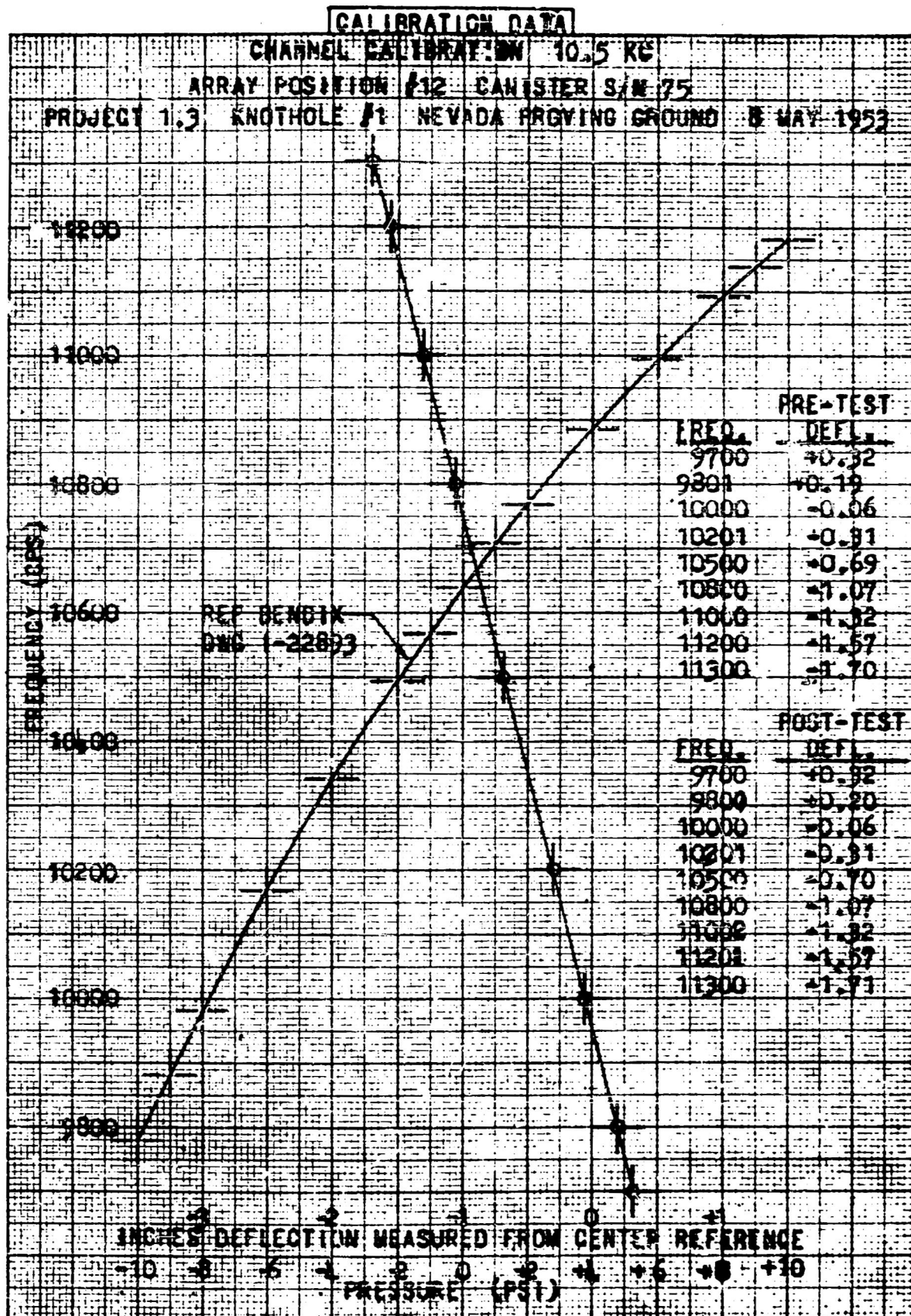


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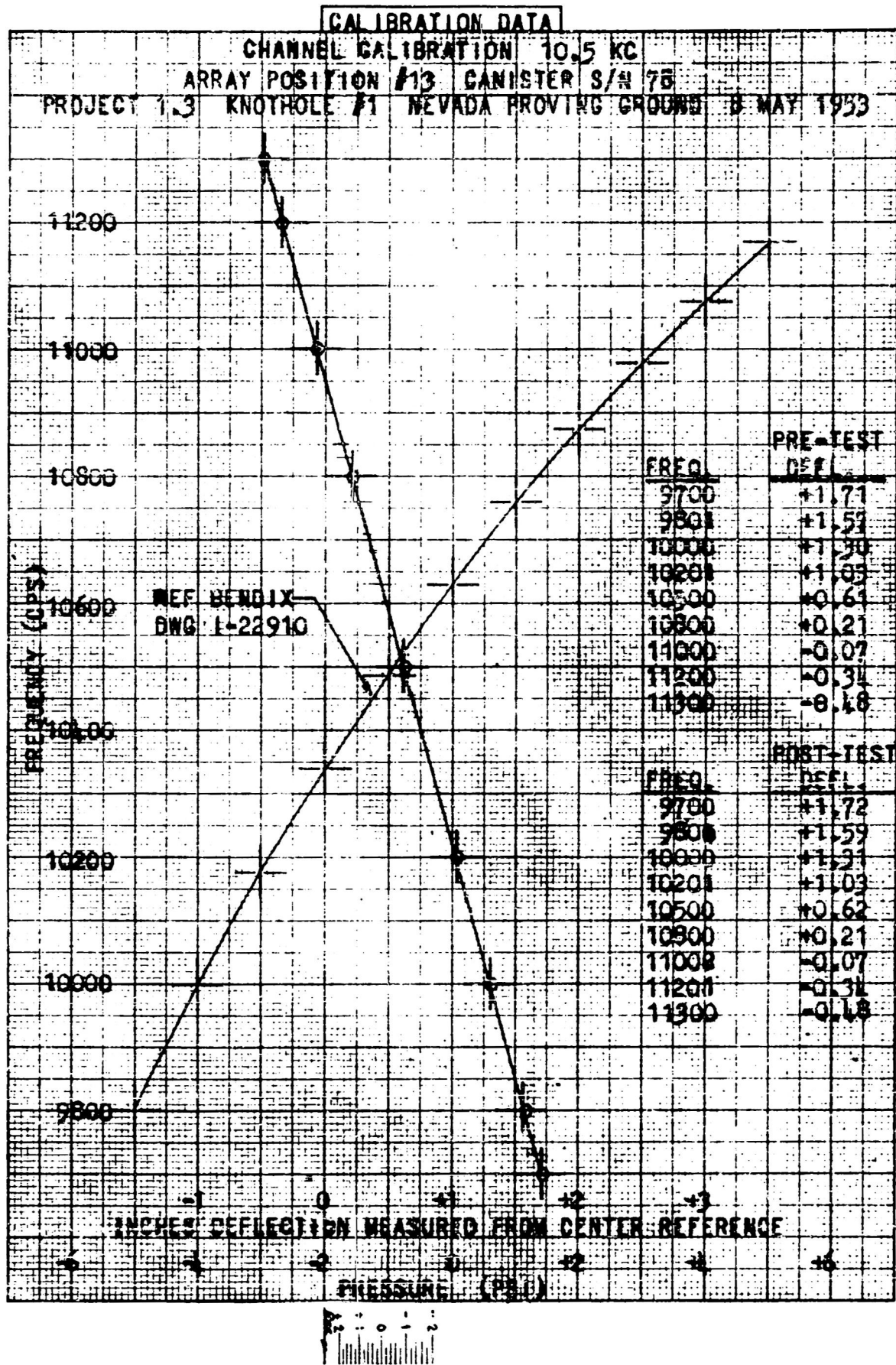


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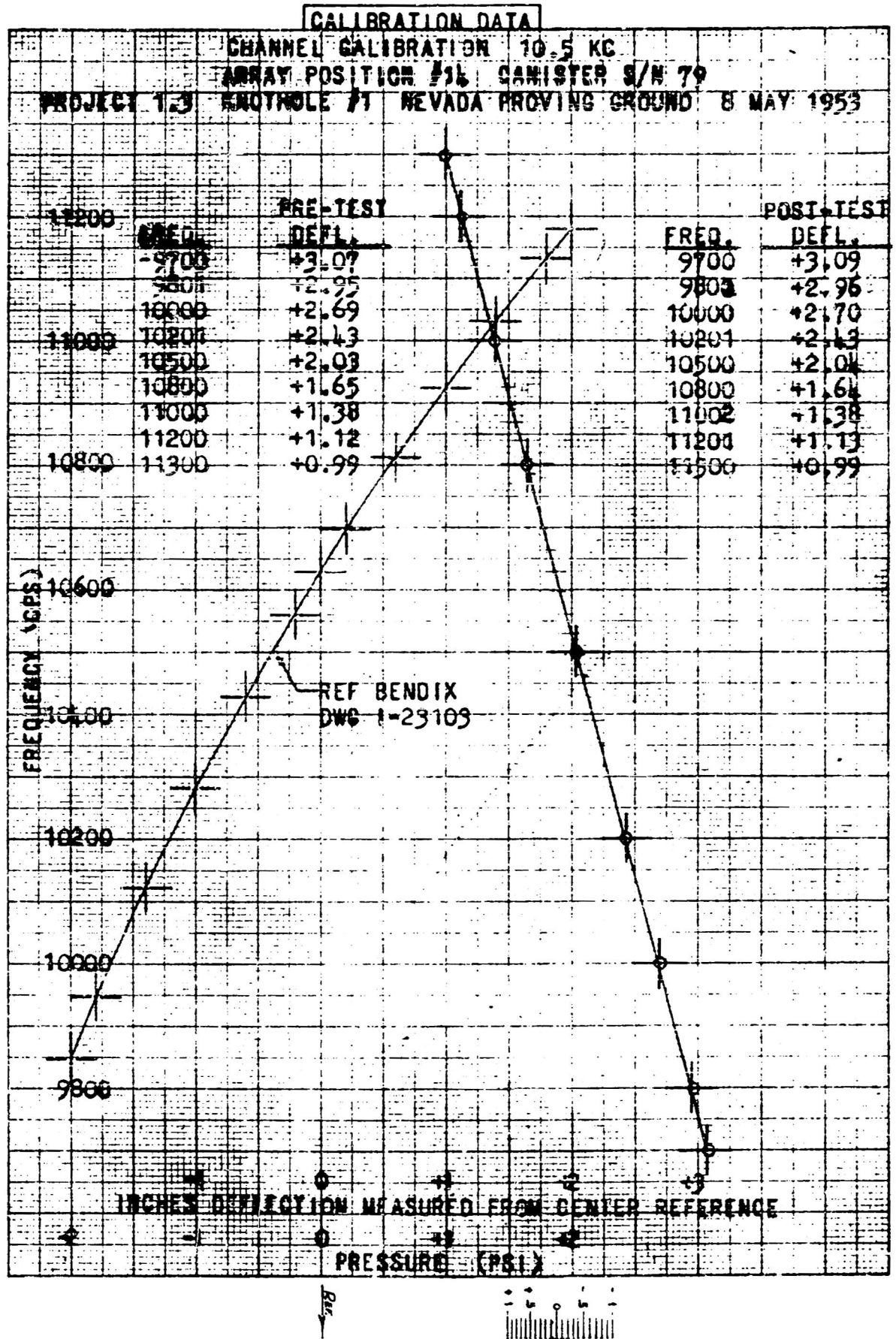


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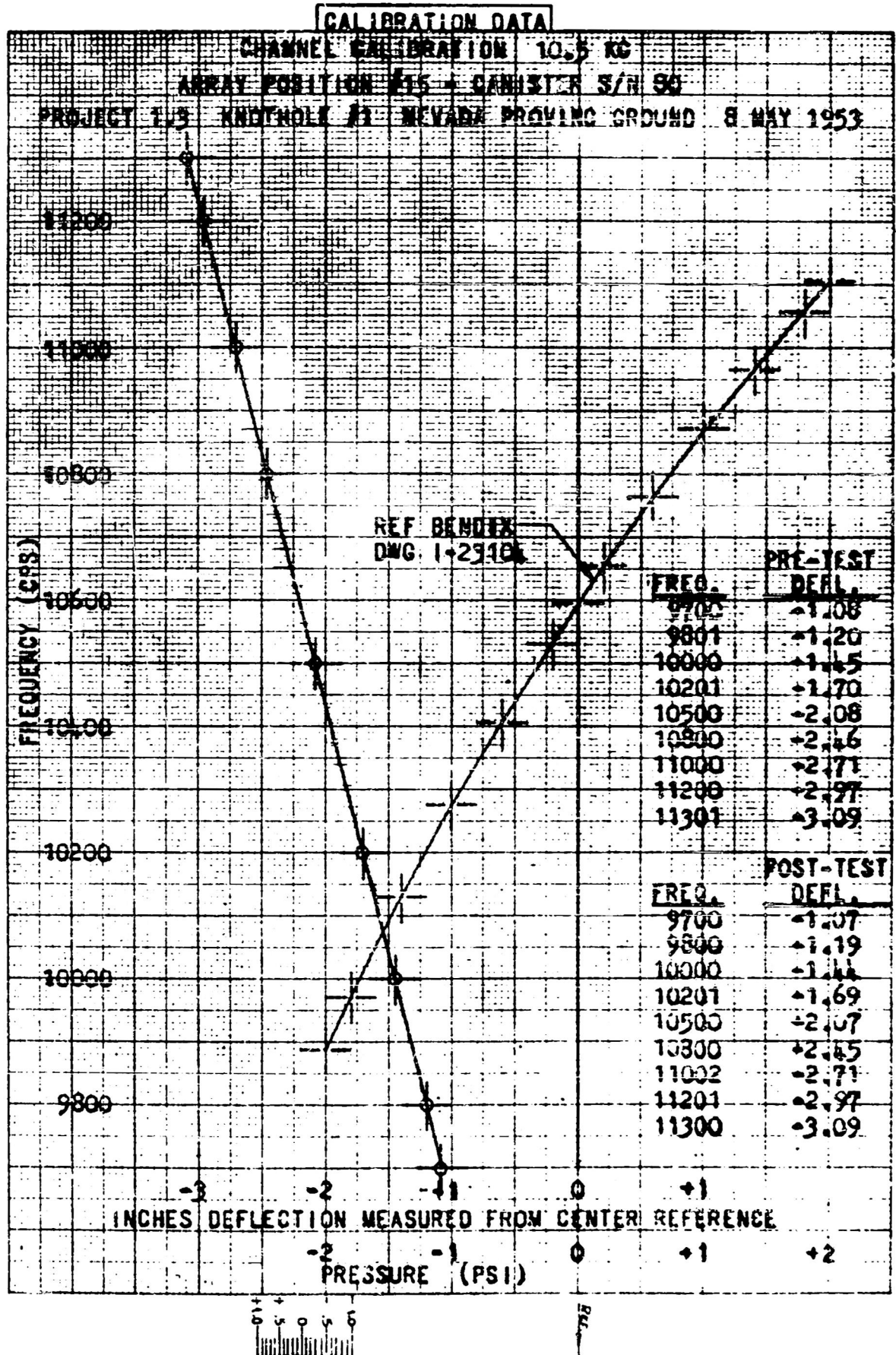


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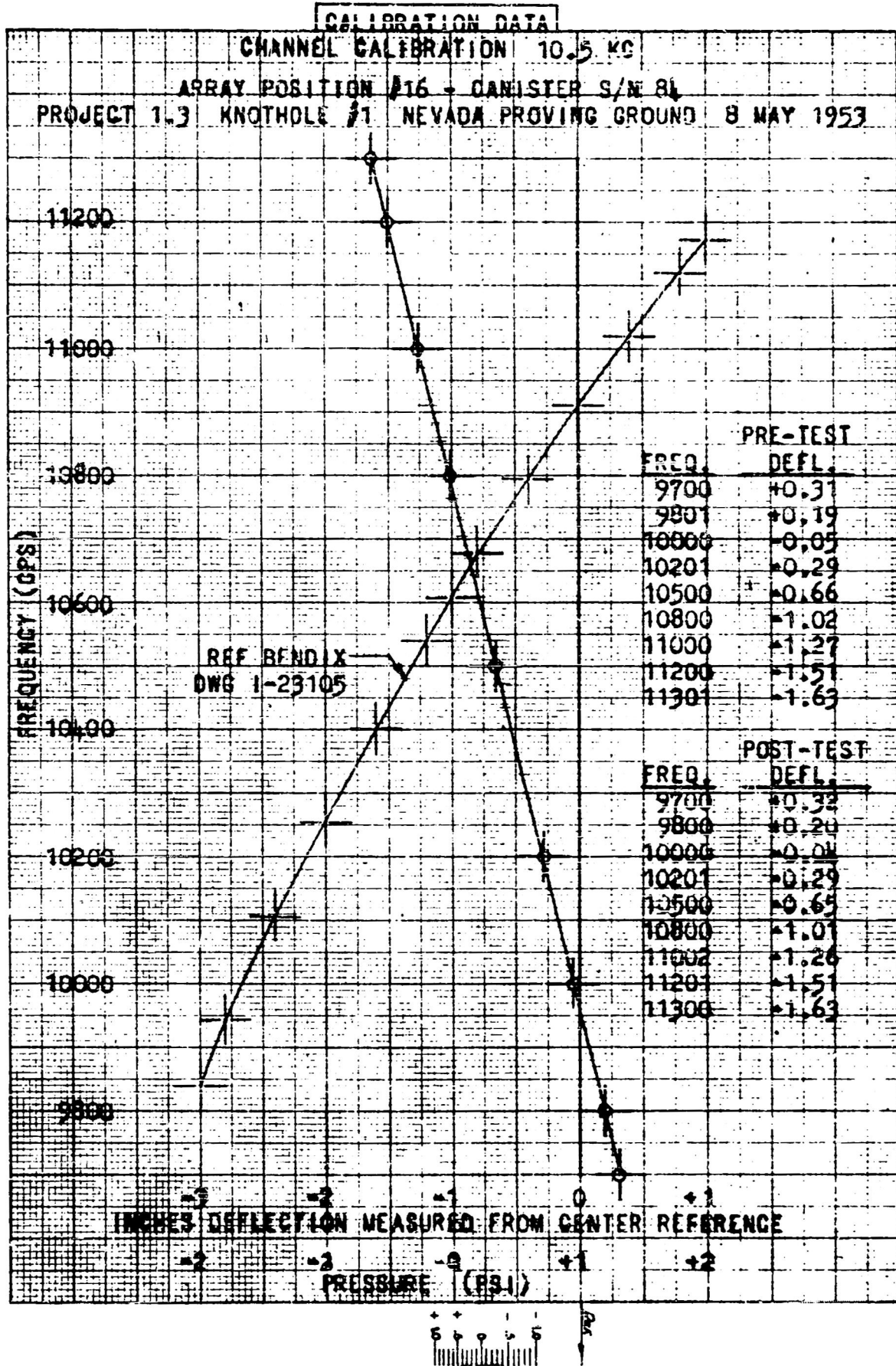


Figure 82

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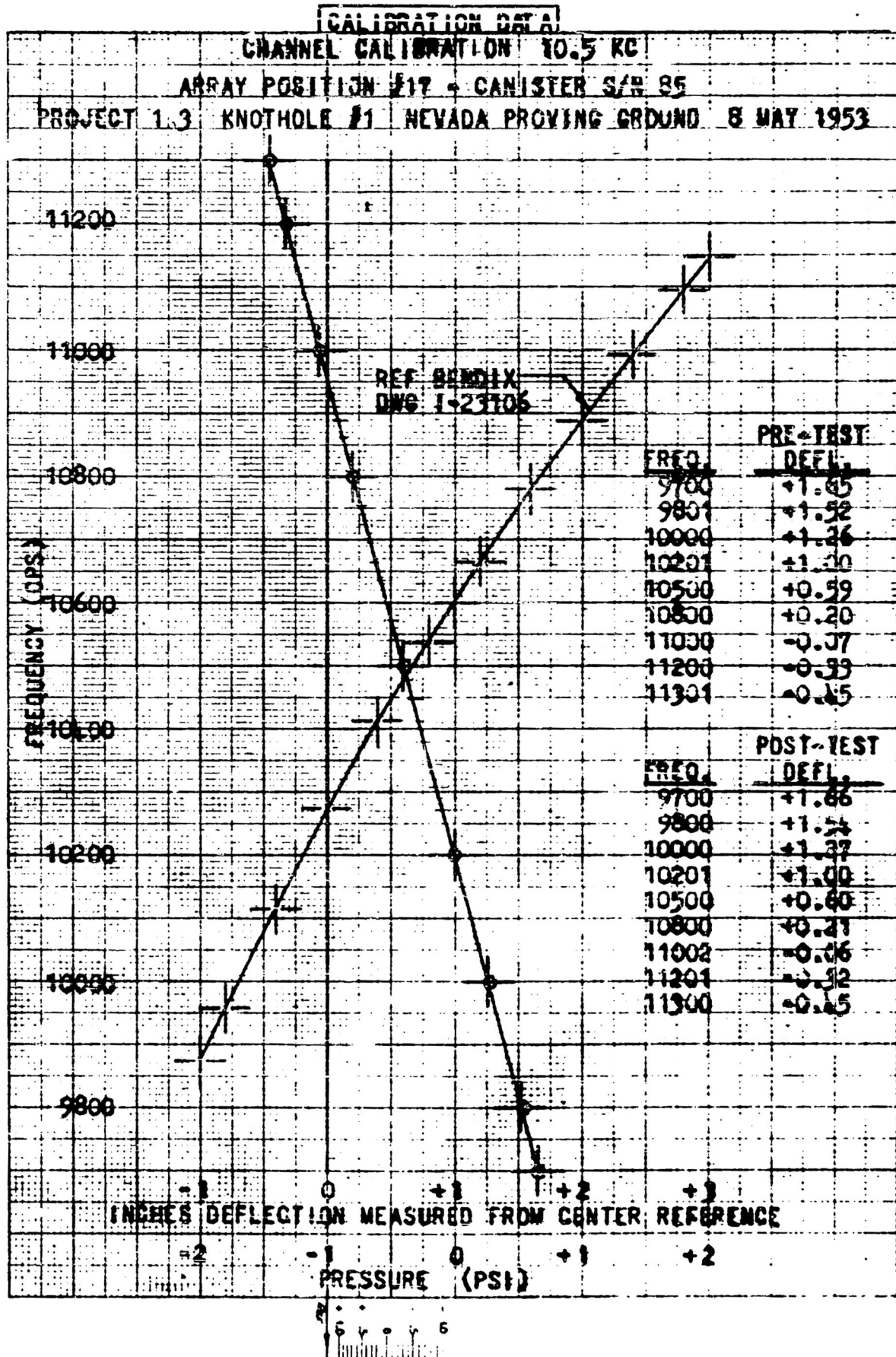


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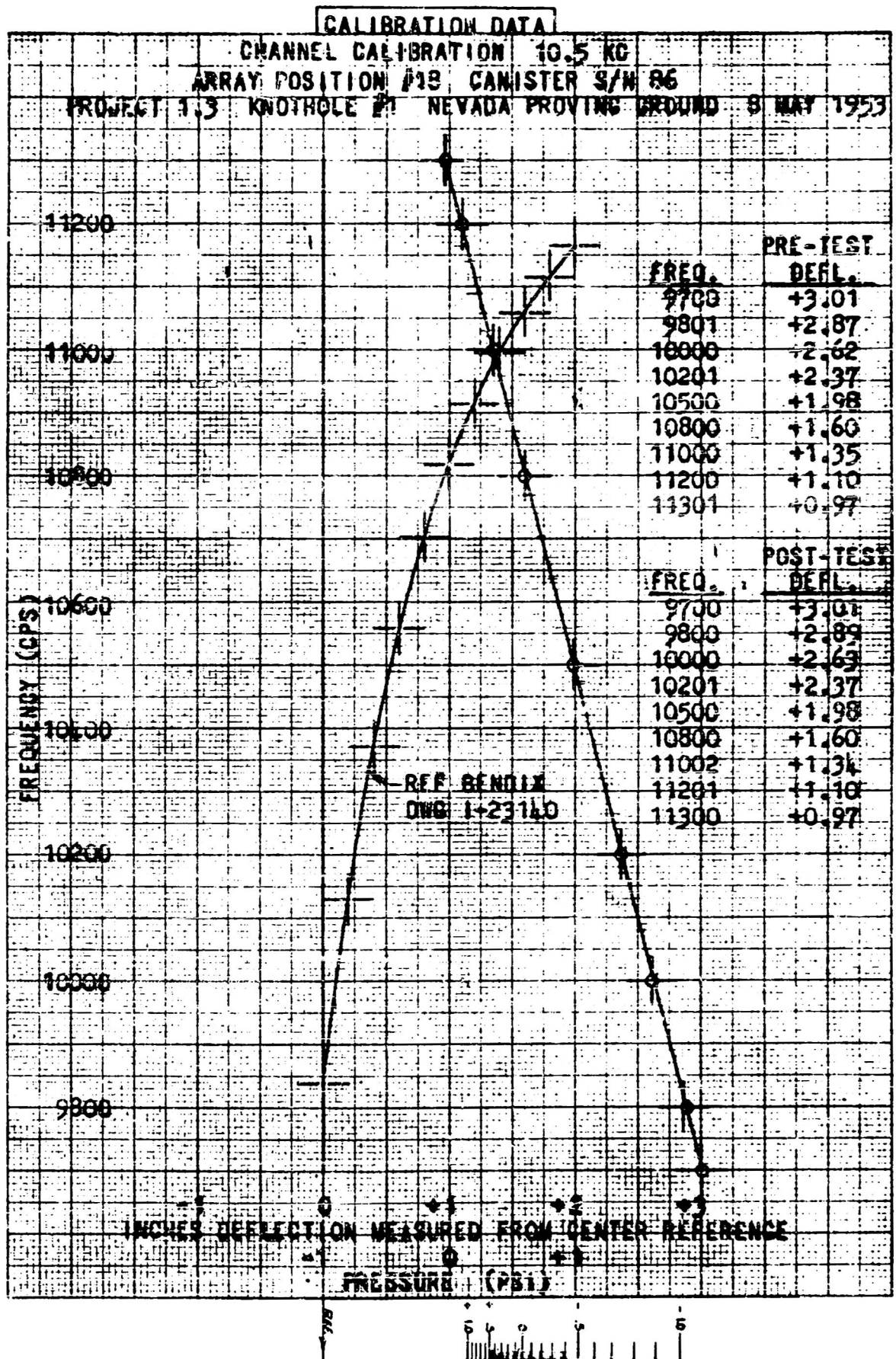


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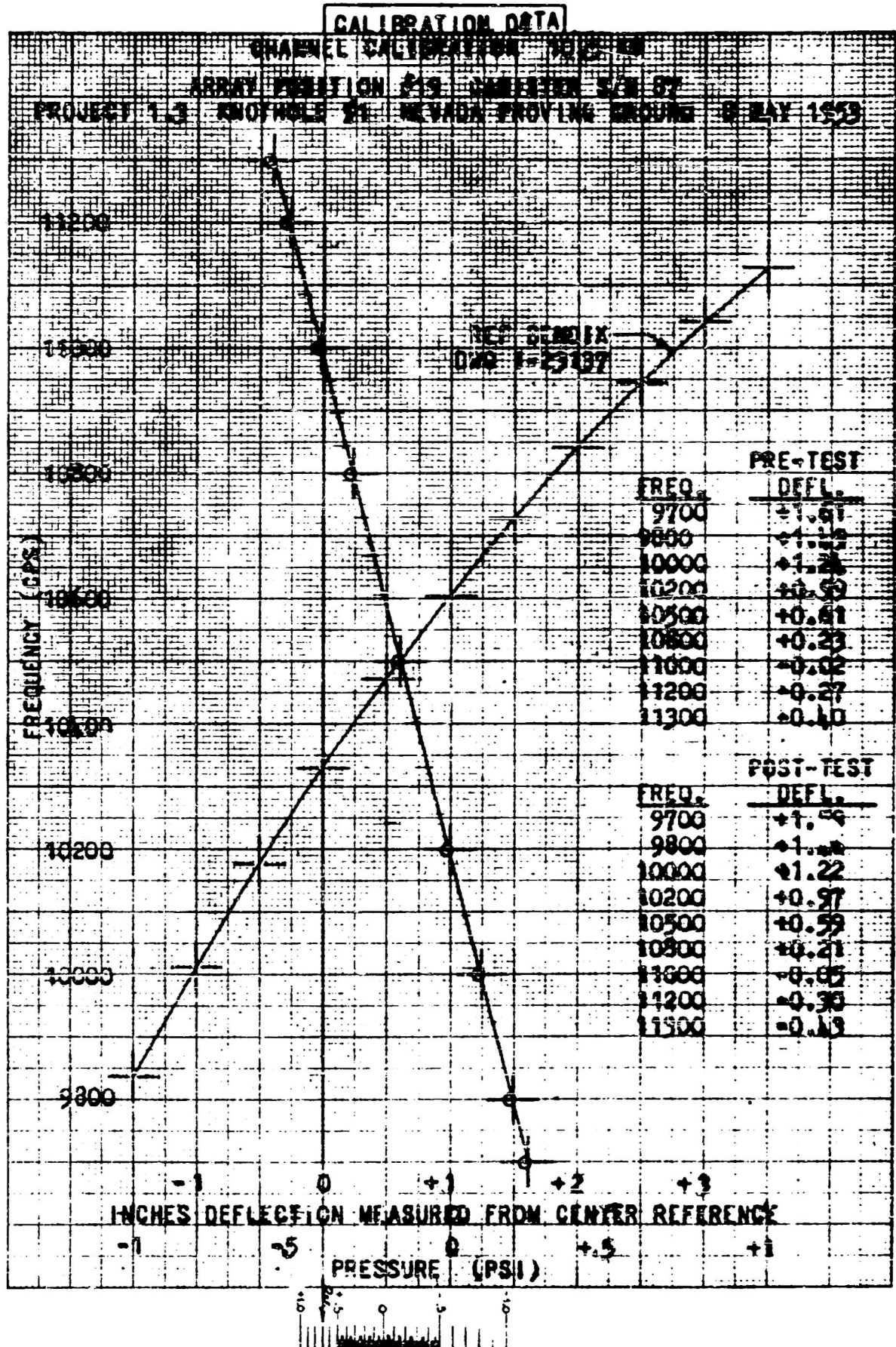


Figure 85

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SECURITY INFORMATION

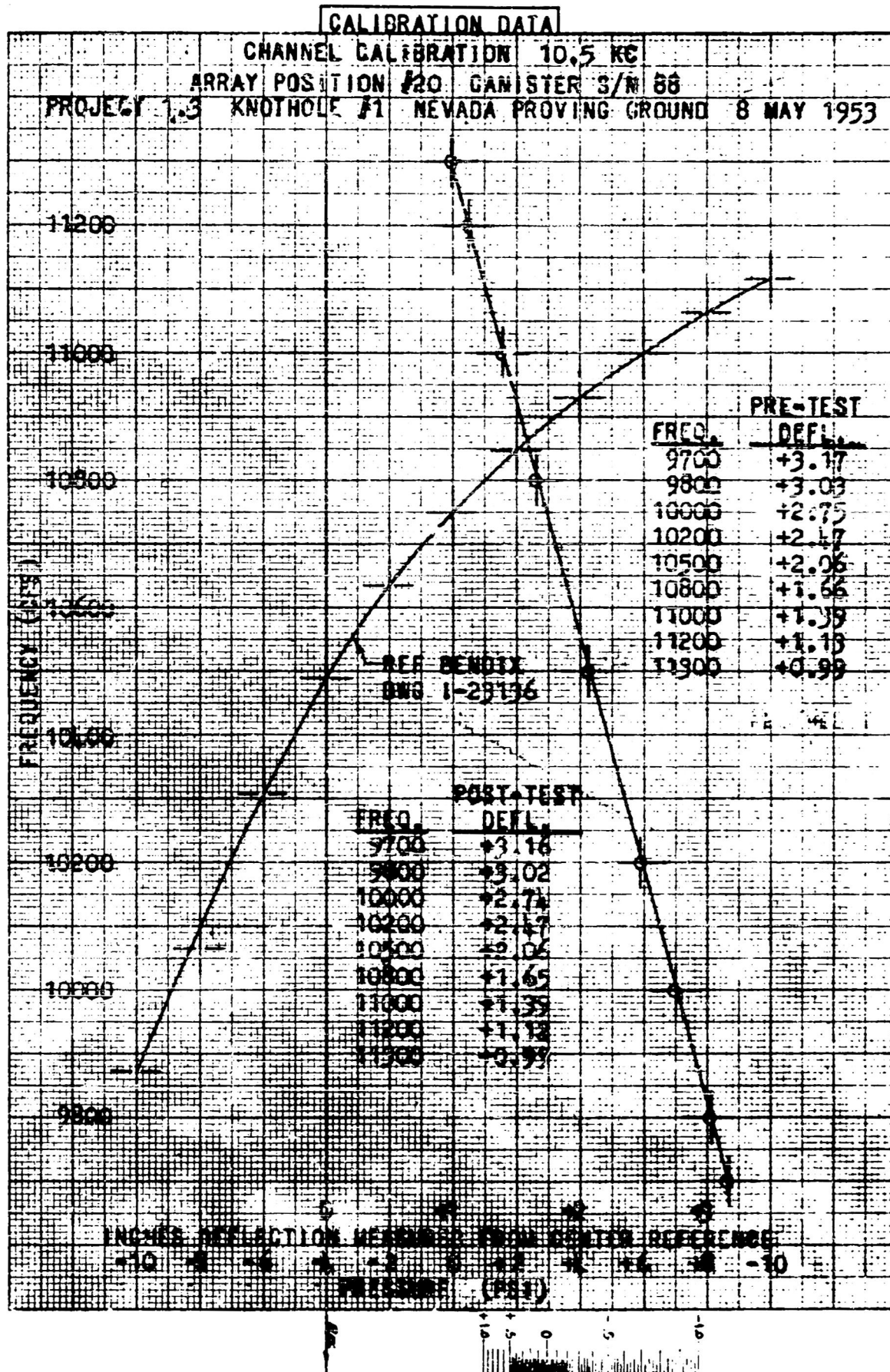


Figure 86

CALIBRATION DATA

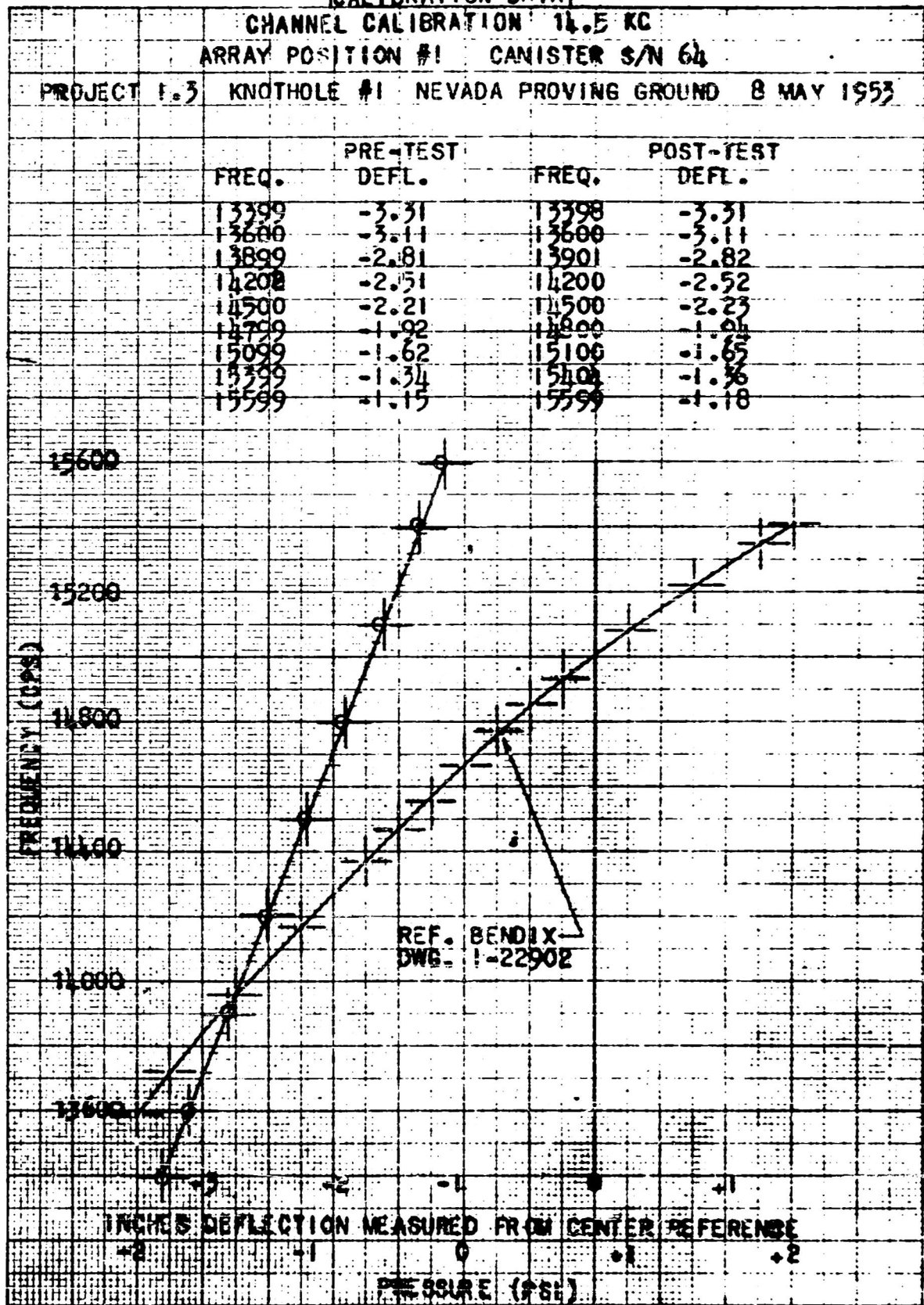


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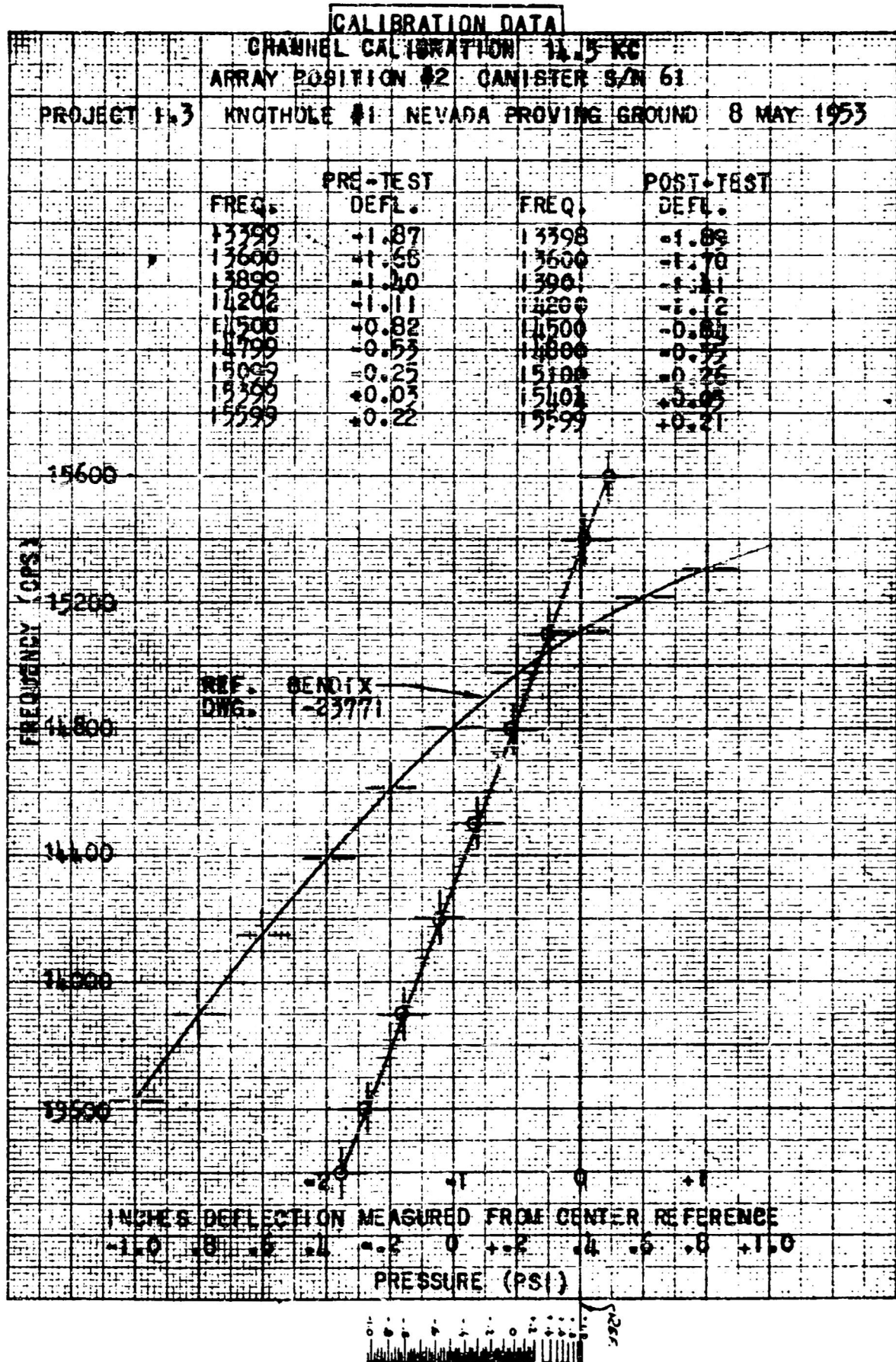


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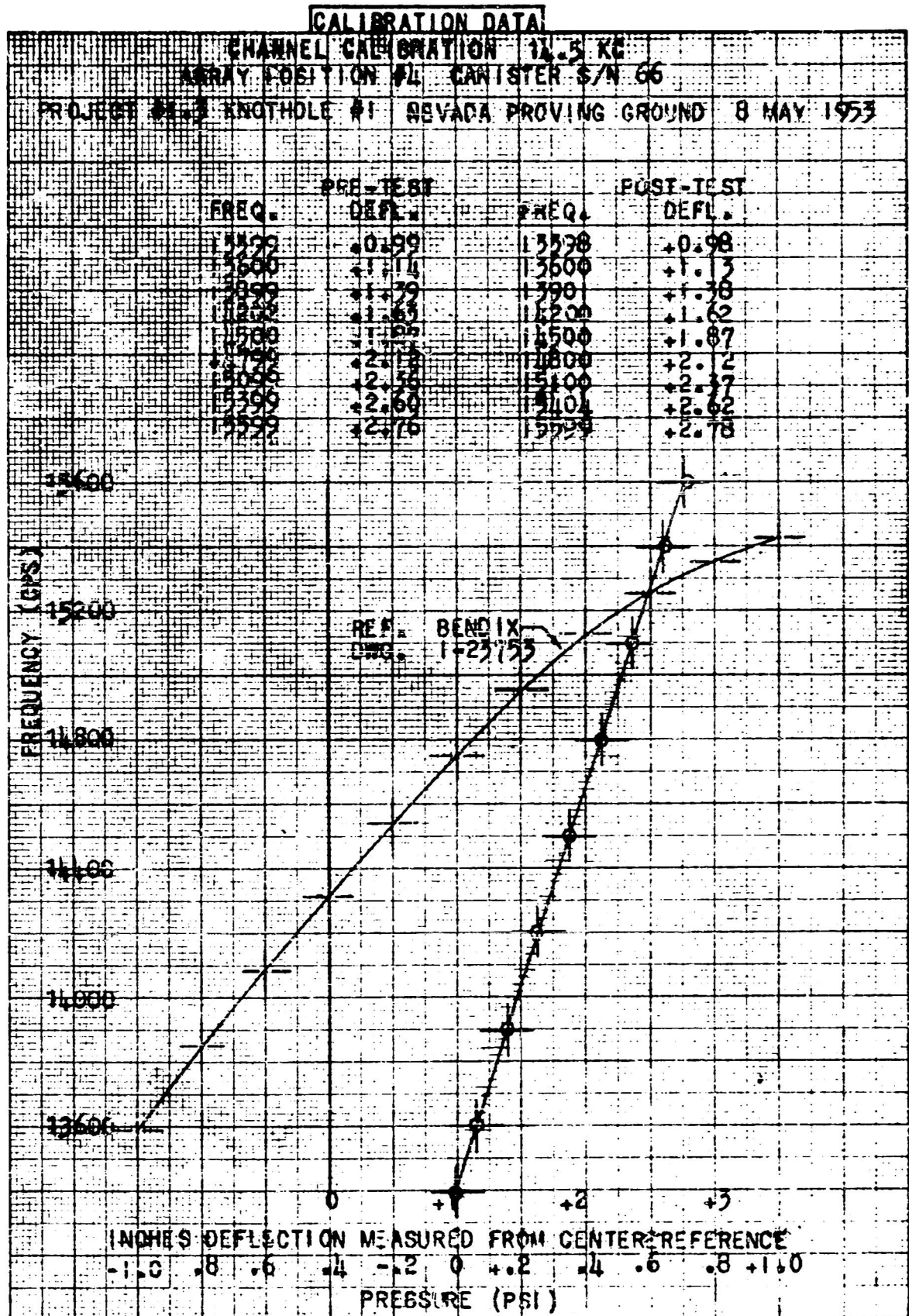


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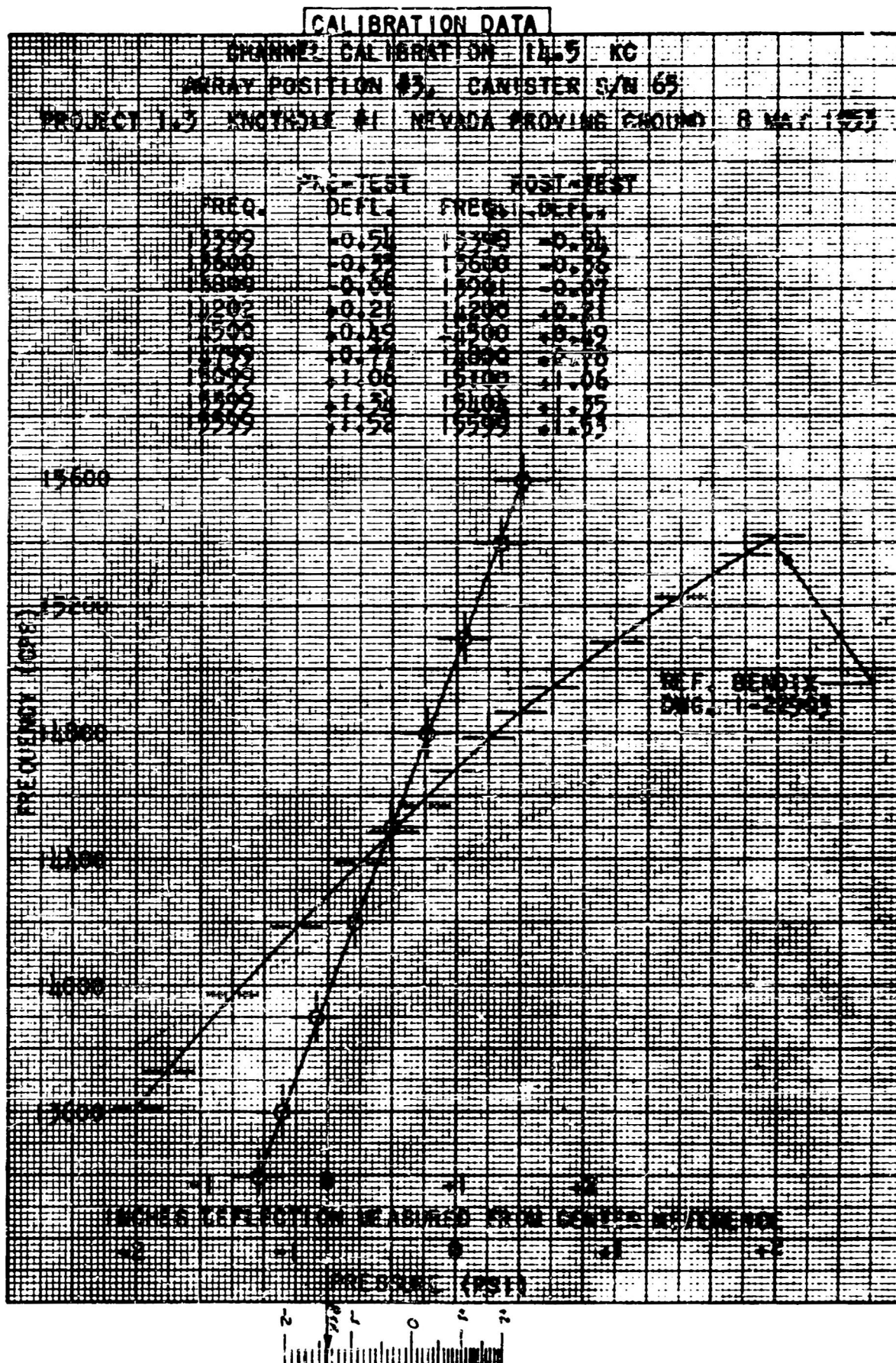


Figure 90

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SECURITY INFORMATION

CALIBRATION DATA

CHANNEL CALIBRATION 14.5 KC
ARRAY POSITION #5, CANISTER S/N 67

PROJECT 1-3 KNOTHOLE #1 NEVADA PROVING GROUND 8 MAY 1953

| PRE-TEST | | POST-TEST | |
|----------|-------|-----------|-------|
| FREQ. | DEFL. | FREQ. | DEFL. |
| 13399 | -3.29 | 13398 | -3.29 |
| 13600 | -3.09 | 13600 | -3.09 |
| 13809 | -2.79 | 13801 | -2.79 |
| 14202 | -2.49 | 14200 | -2.49 |
| 14501 | -2.19 | 14500 | -2.19 |
| 14799 | -1.89 | 14799 | -1.89 |
| 15099 | -1.59 | 15101 | -1.59 |
| 15399 | -1.29 | 15401 | -1.29 |
| 15599 | -1.10 | 15599 | -1.10 |

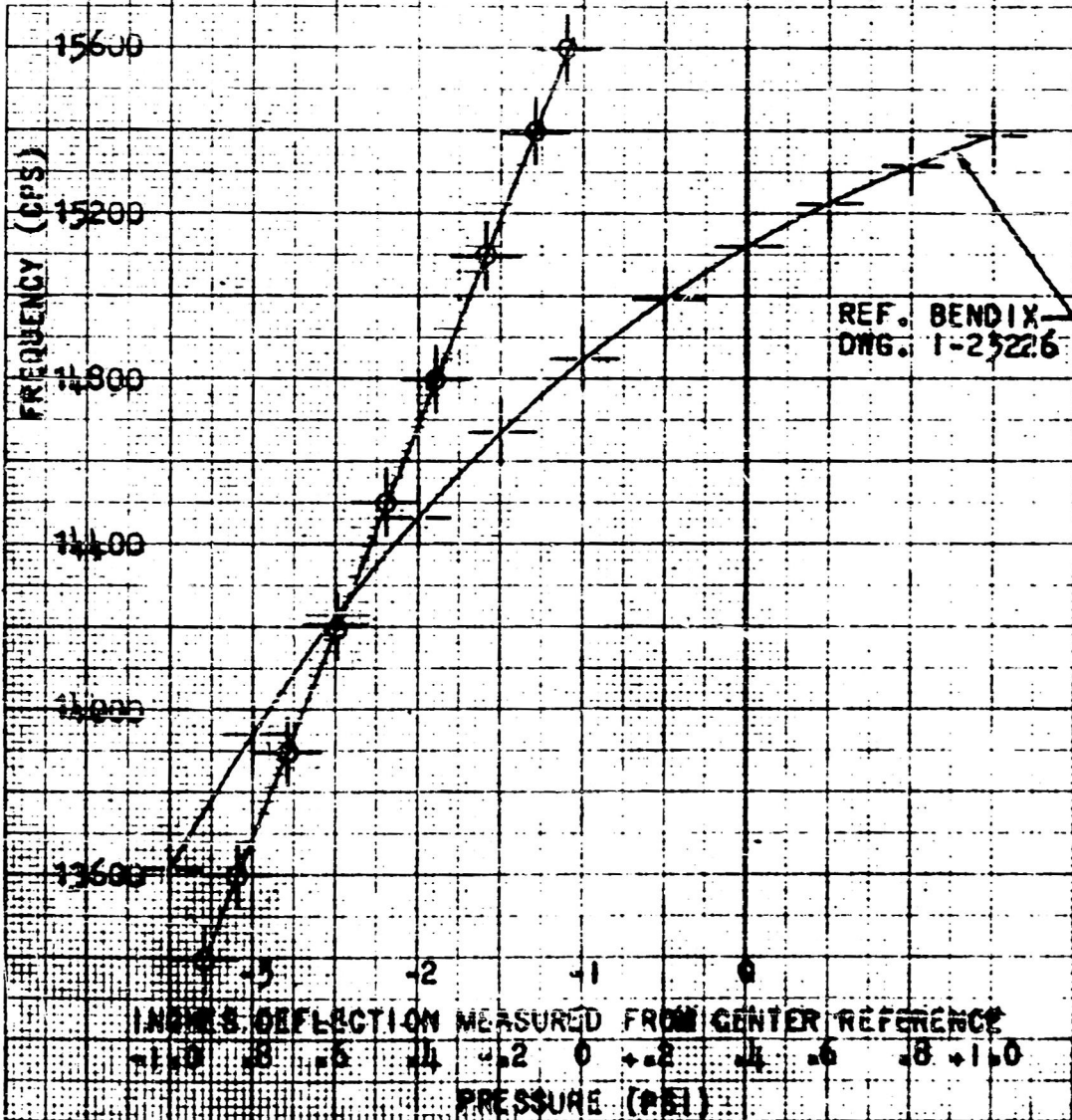


Figure 91

CALIBRATION DATA

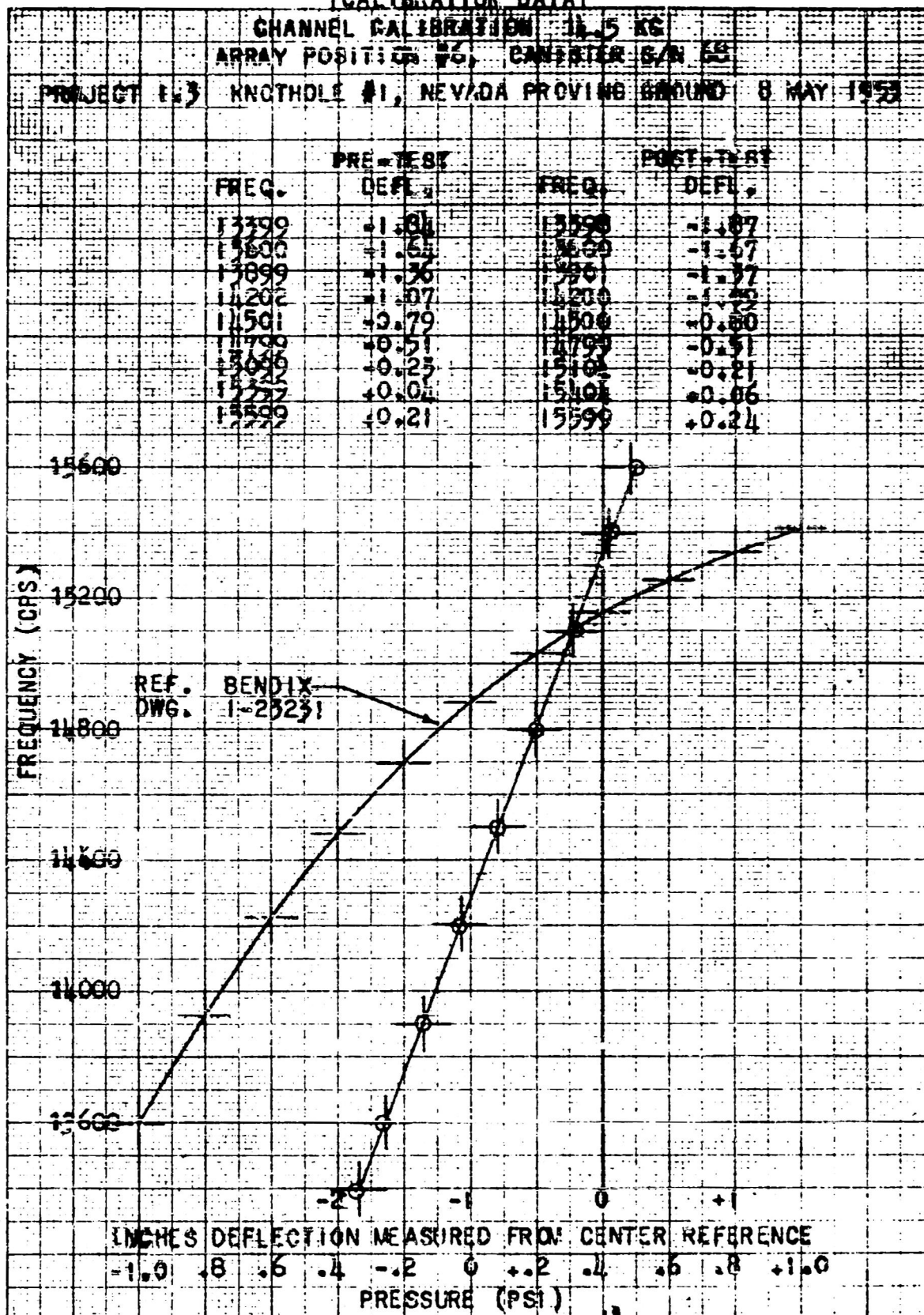


Figure 92

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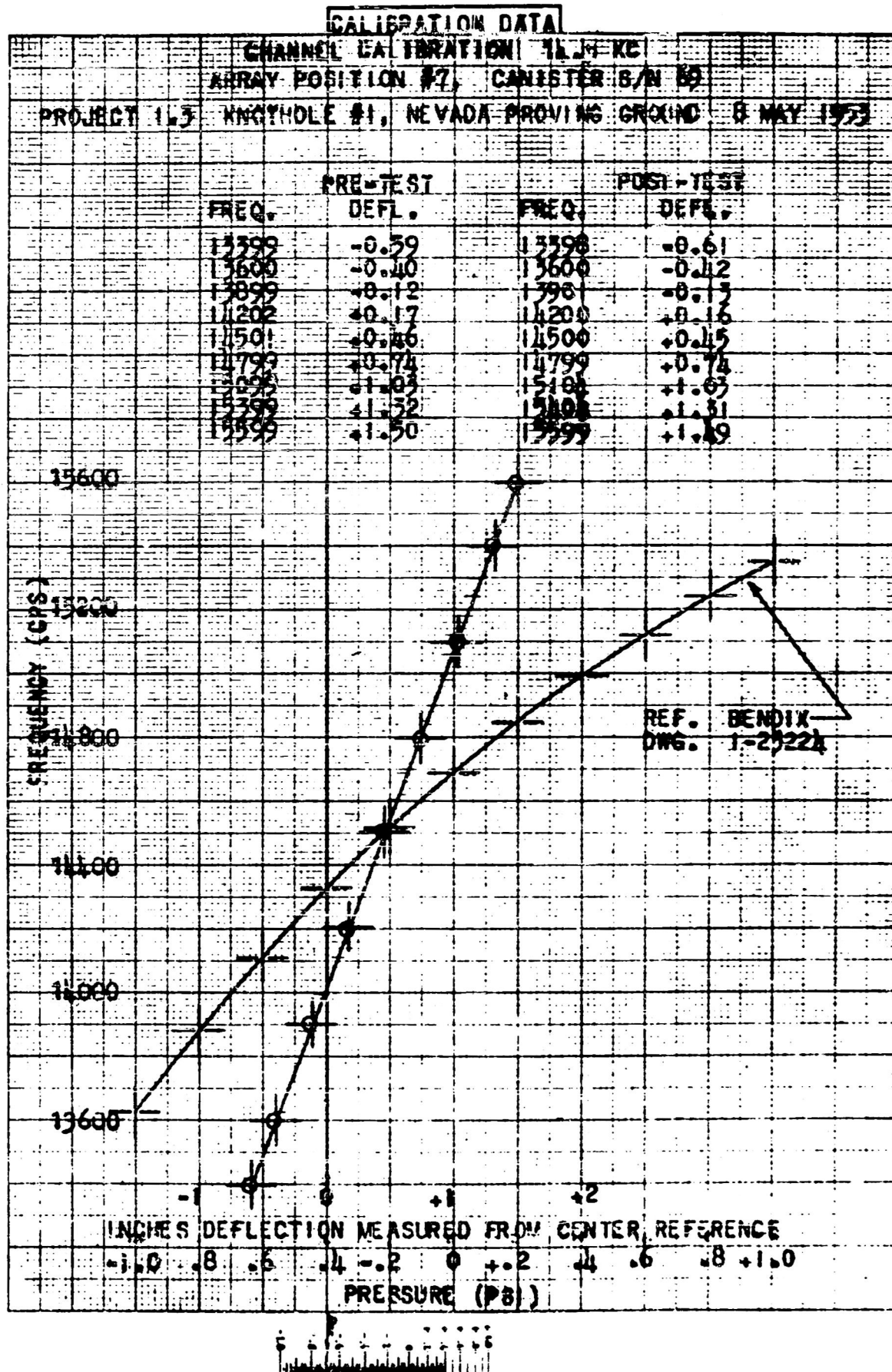


Figure 93

SECRET
SECURITY INFORMATION

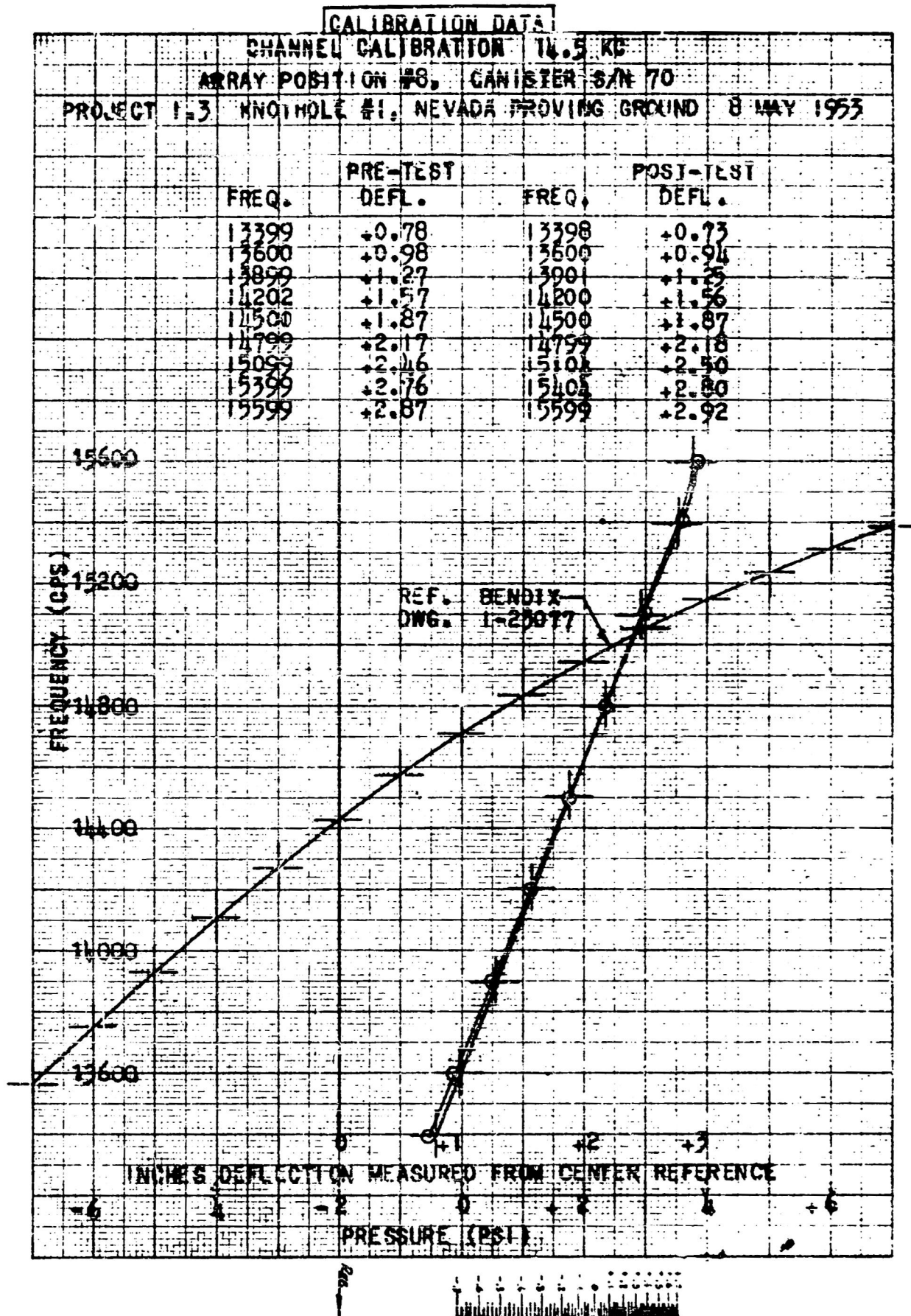


Figure 9h

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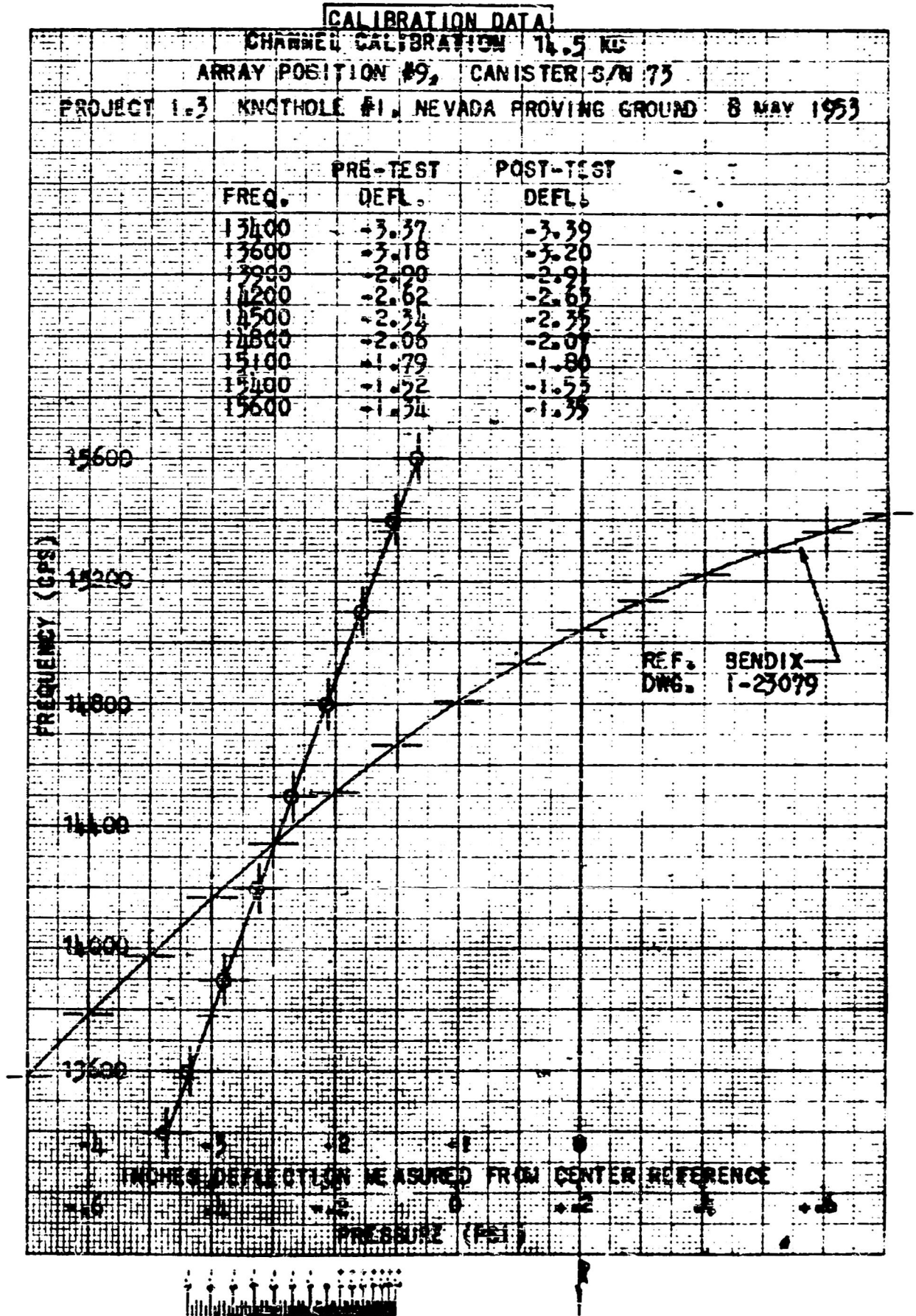


Figure 95

CALIBRATION DATA

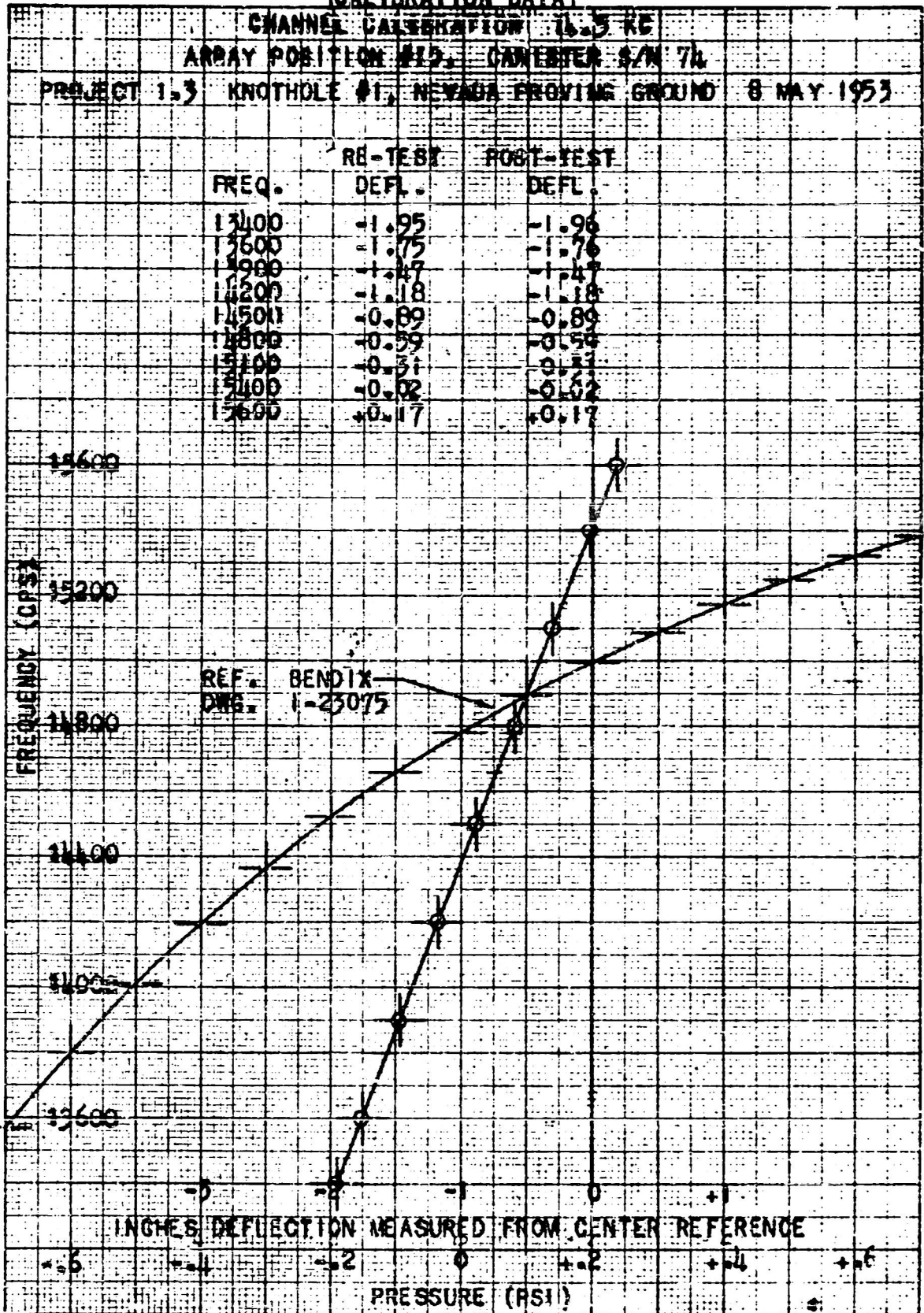


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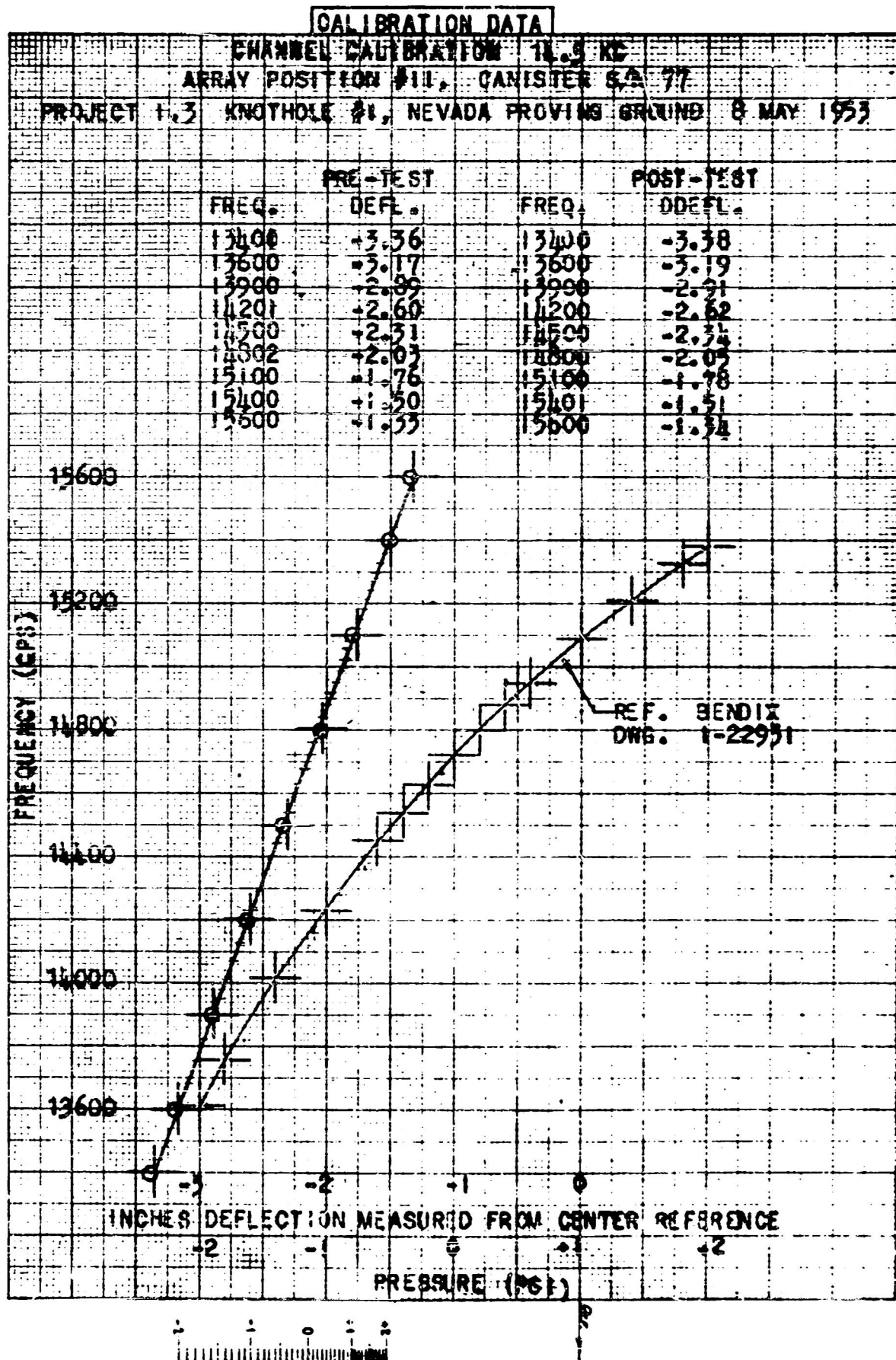


Figure 97

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SECURITY INFORMATION

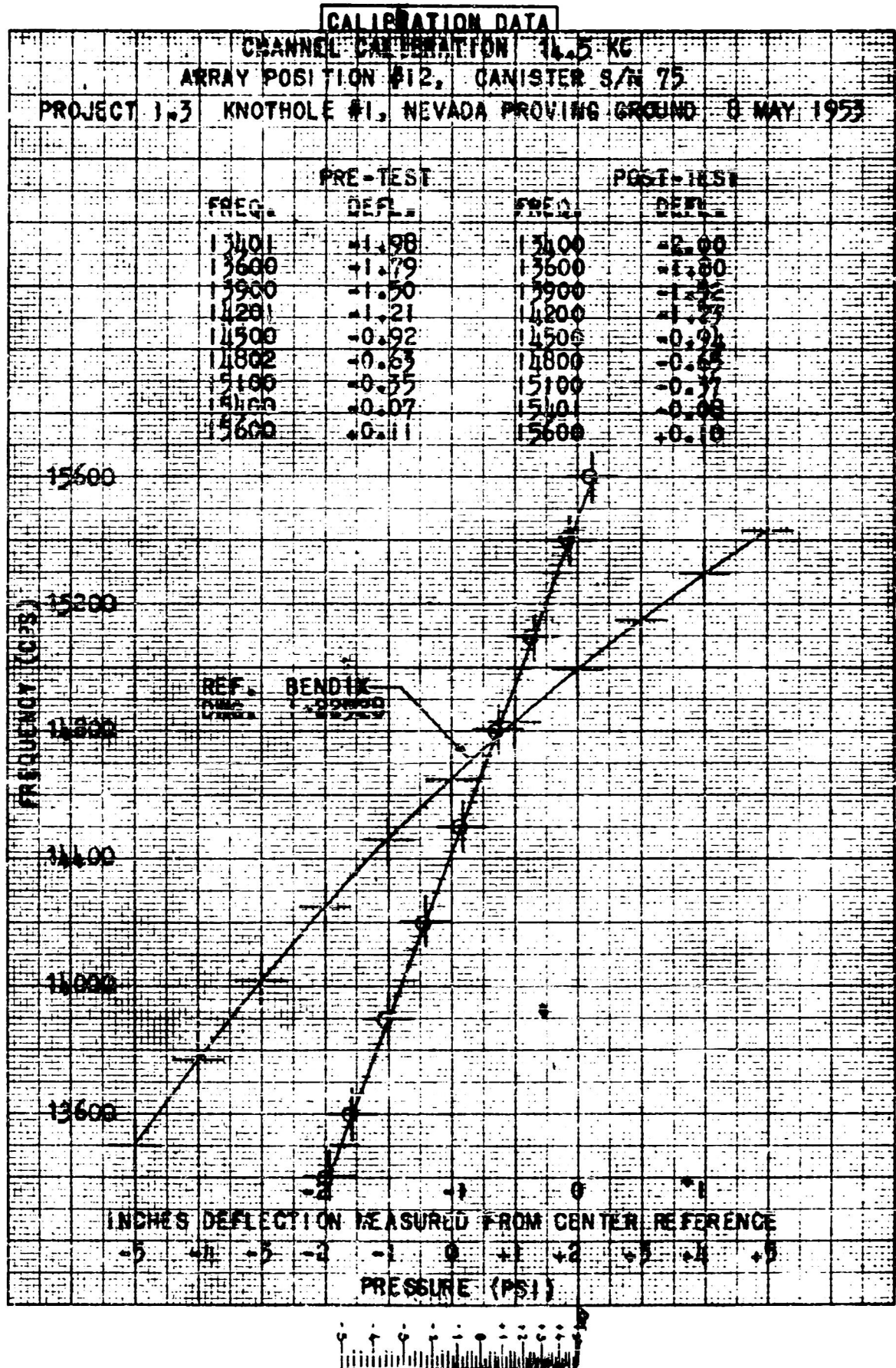


Figure 98

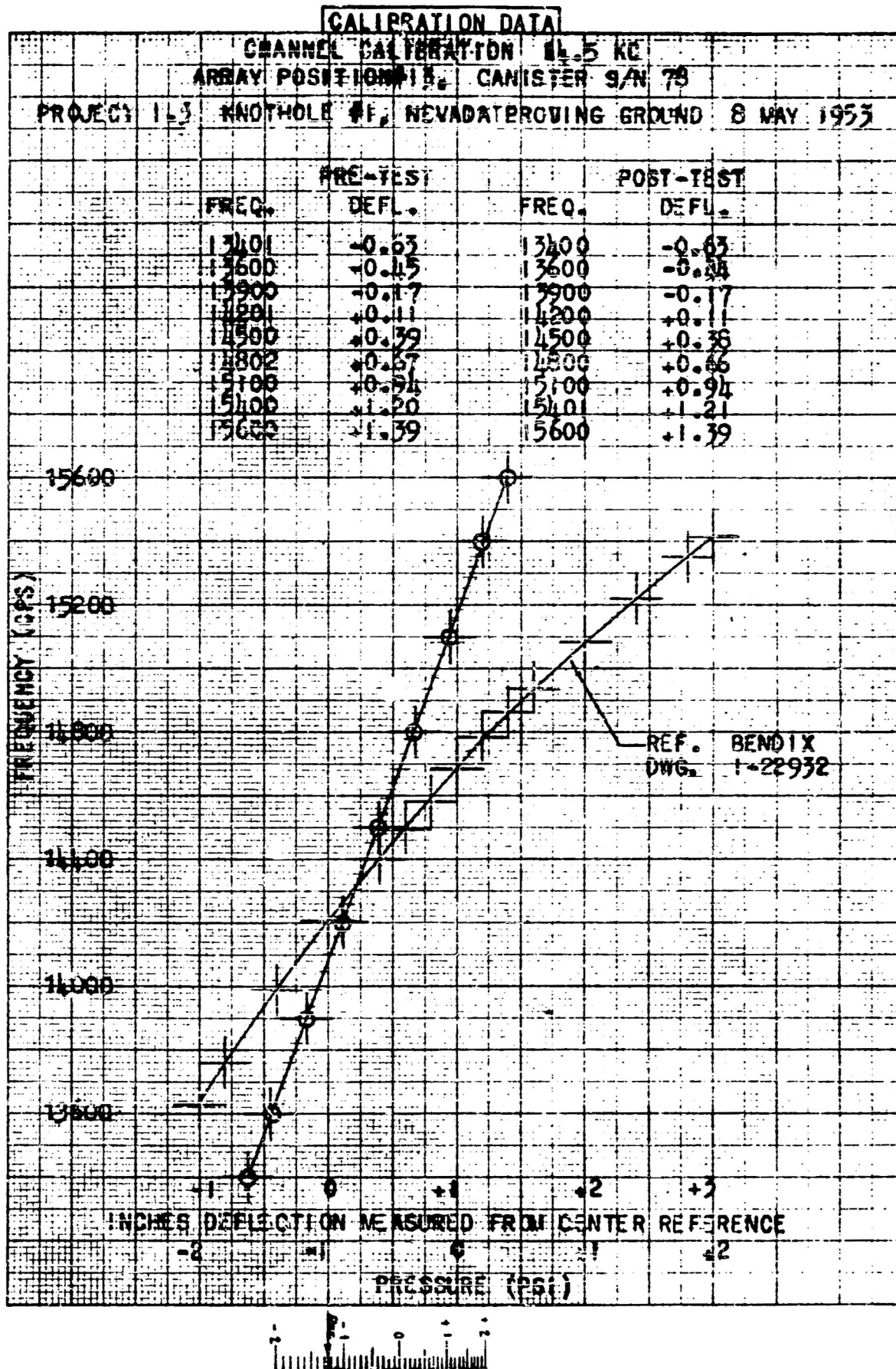


Figure 99

SECRET
SECURITY INFORMATION

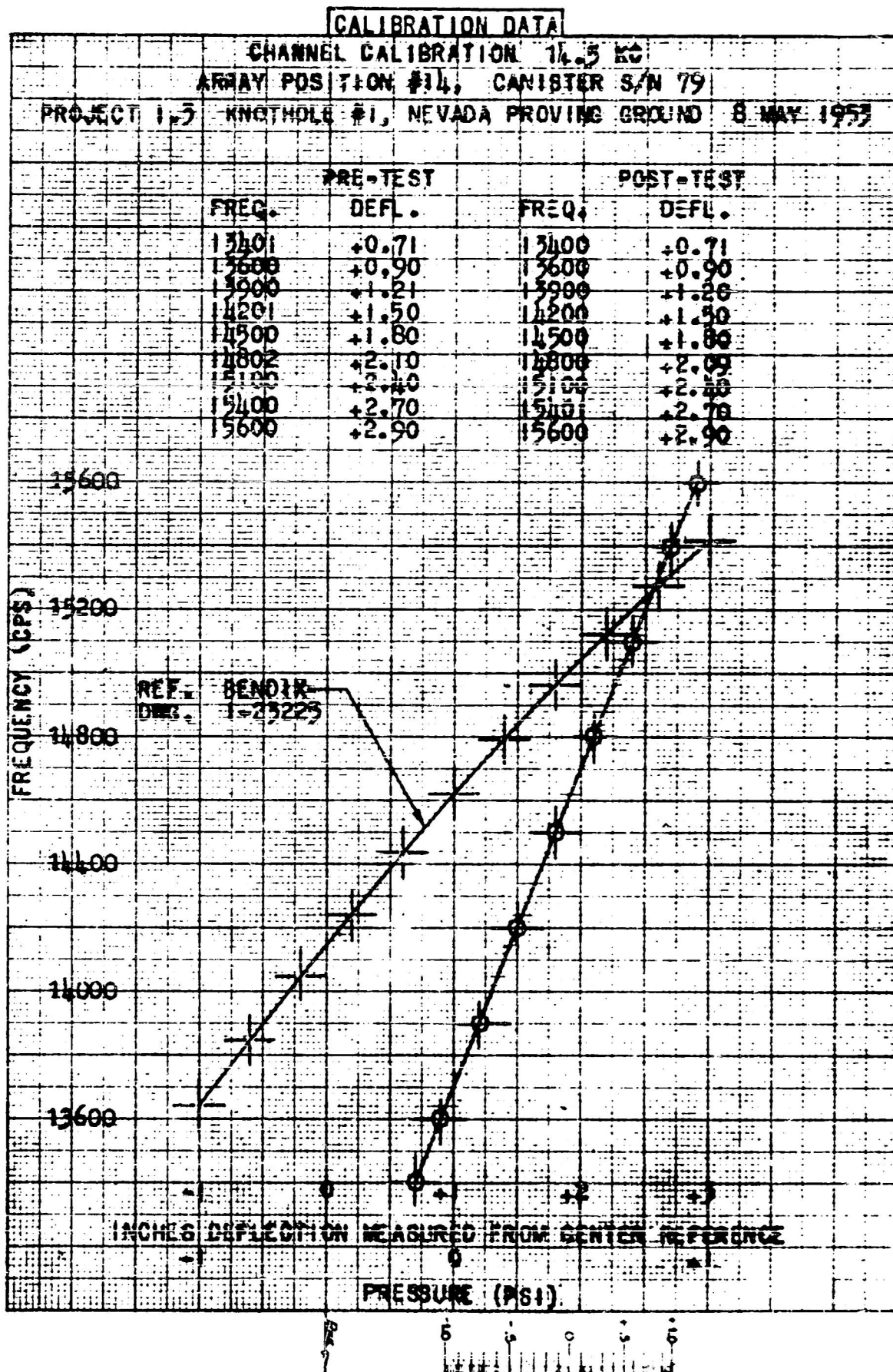


Figure 100

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SECURITY INFORMATION

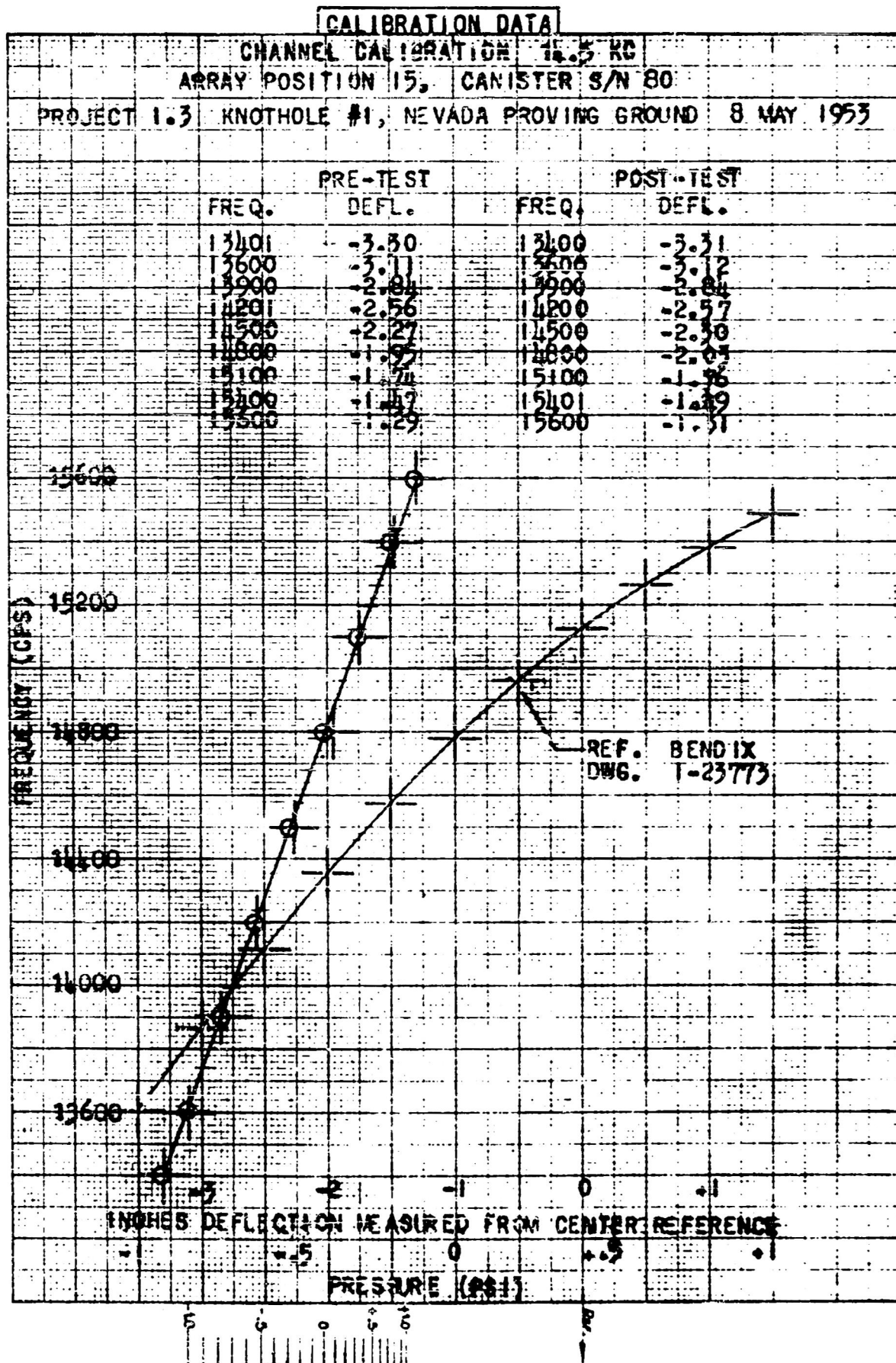


Figure 101

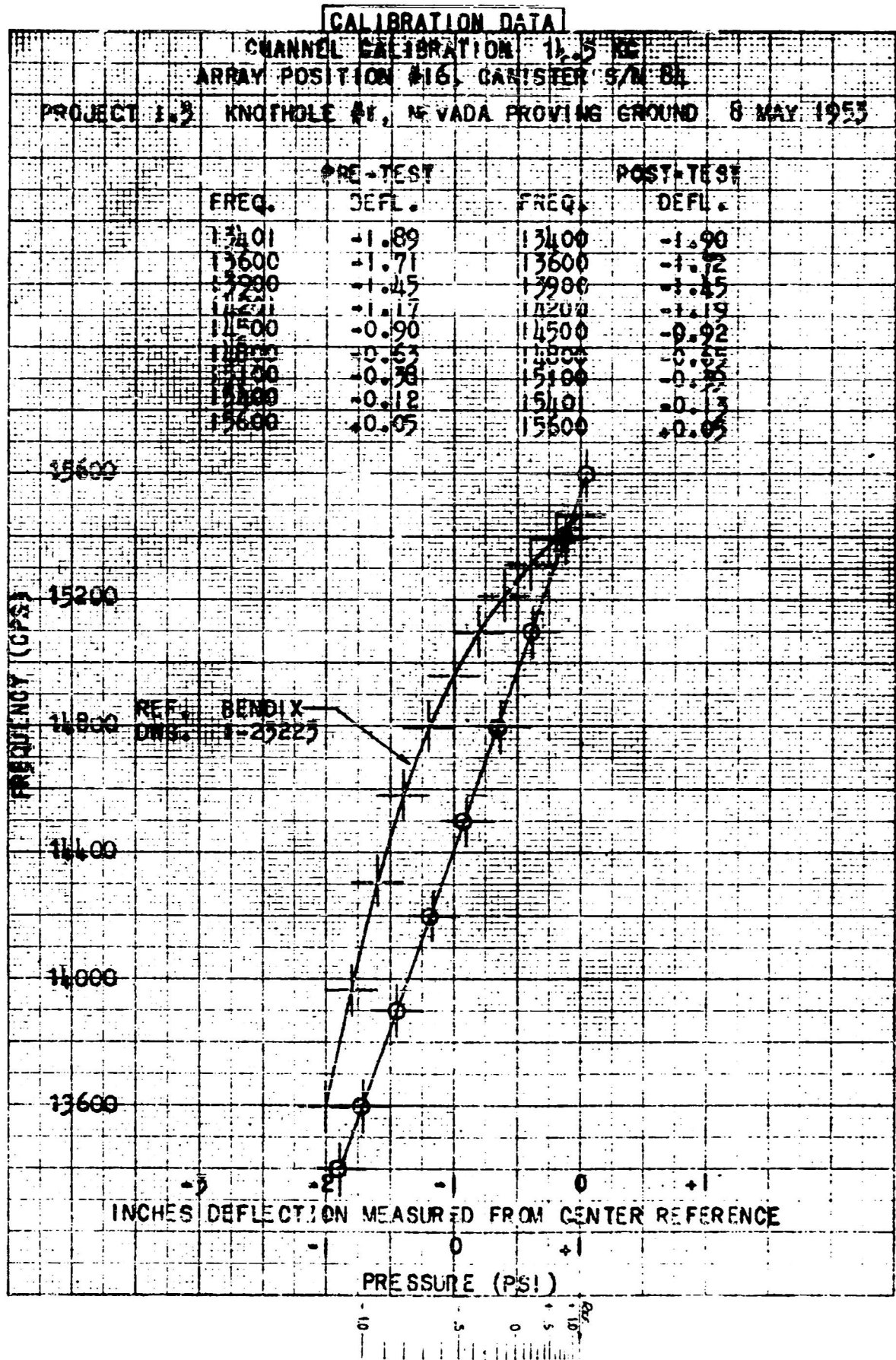


Figure 102

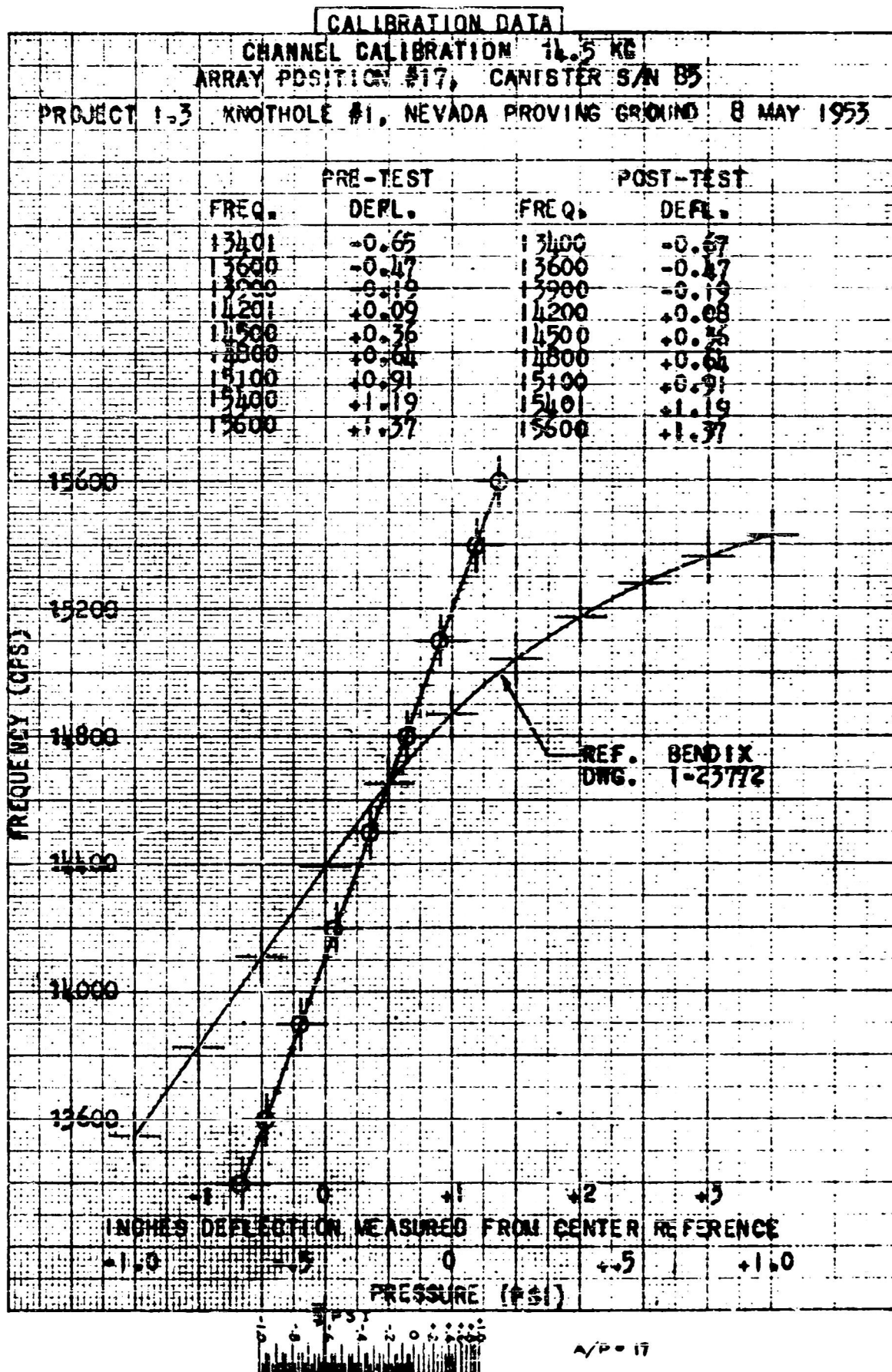


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CALIBRATION DATA

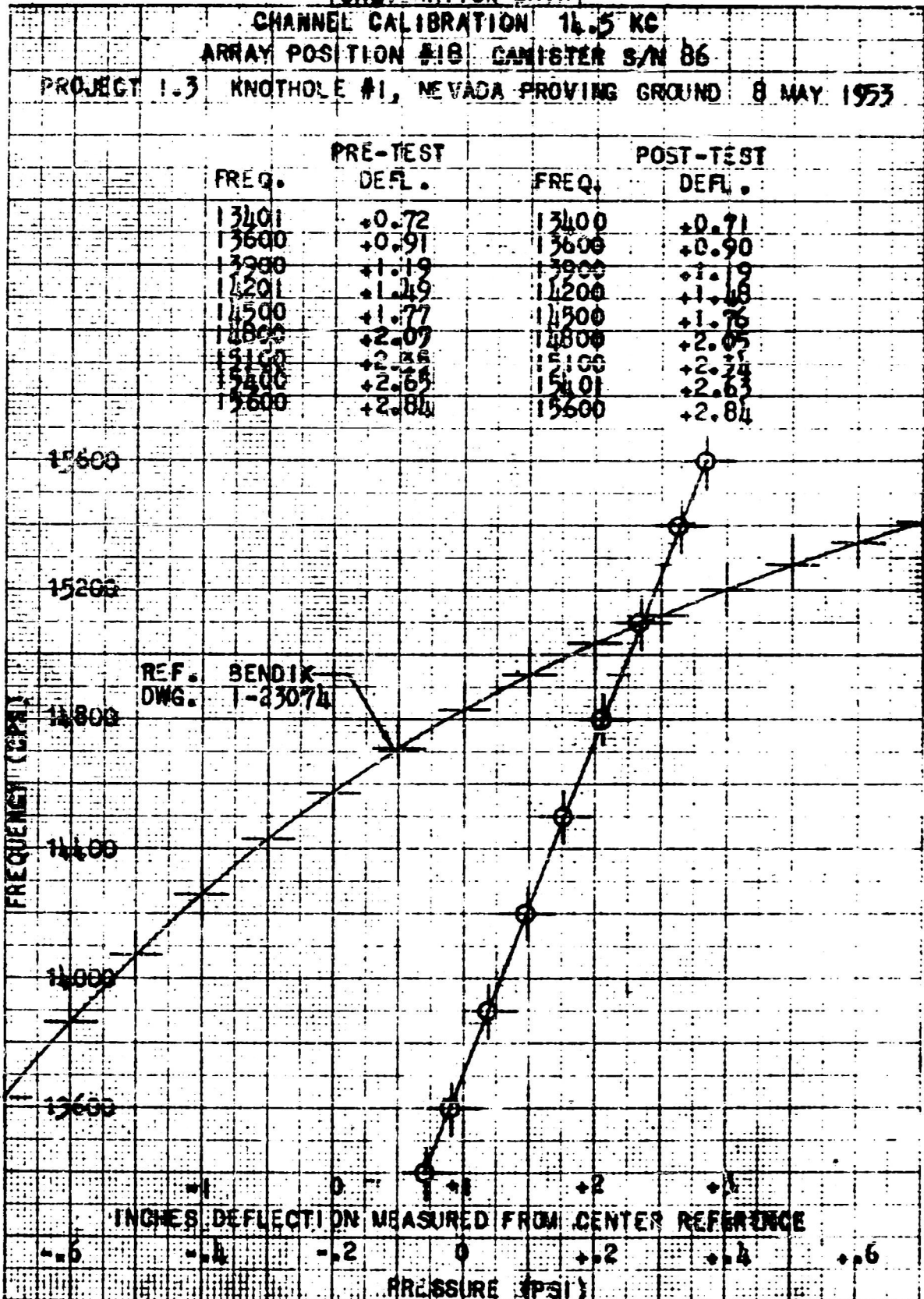


Figure 104

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SECURITY INFORMATION

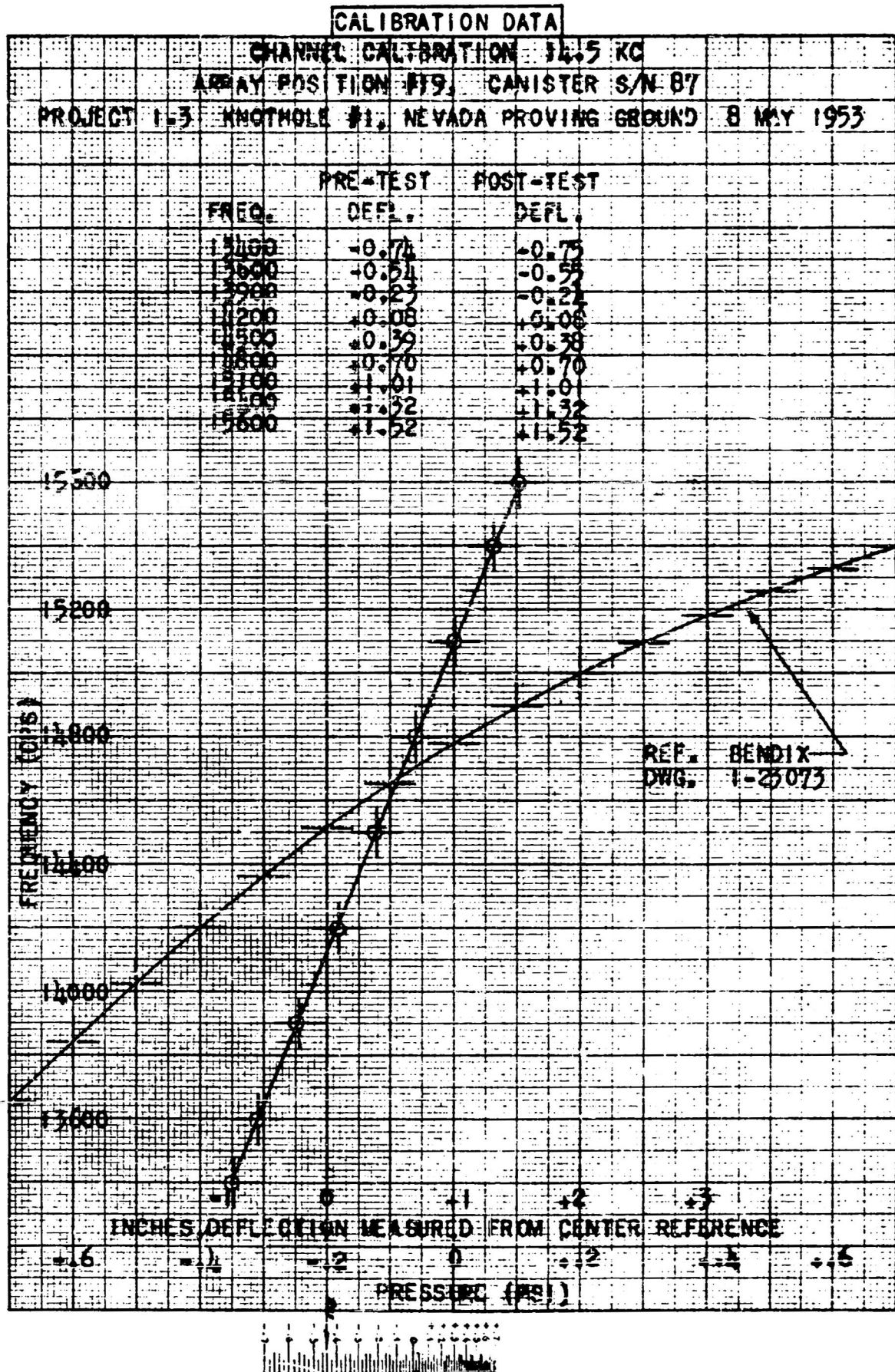


Figure 105

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SECURITY INFORMATION

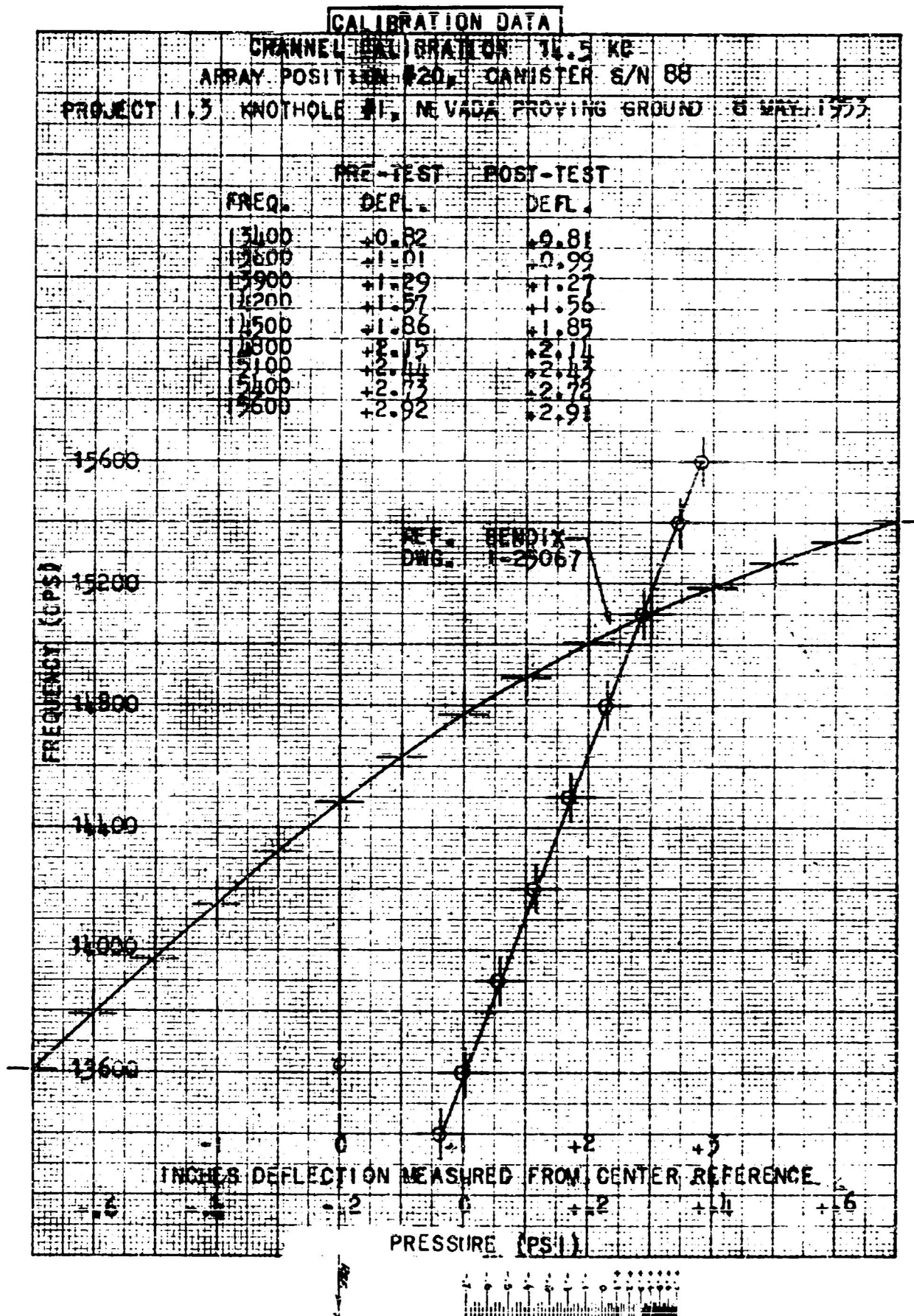


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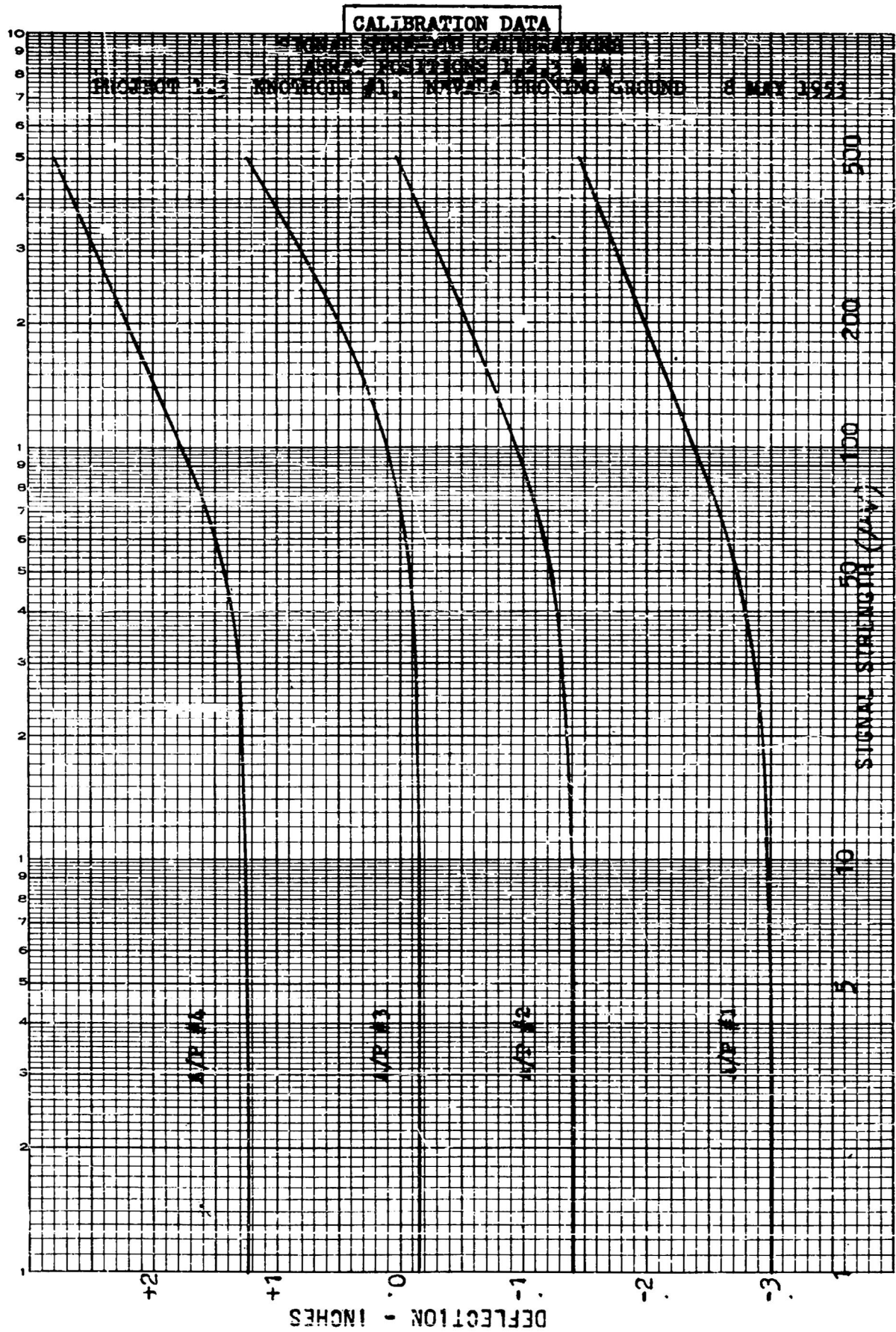


Figure 107

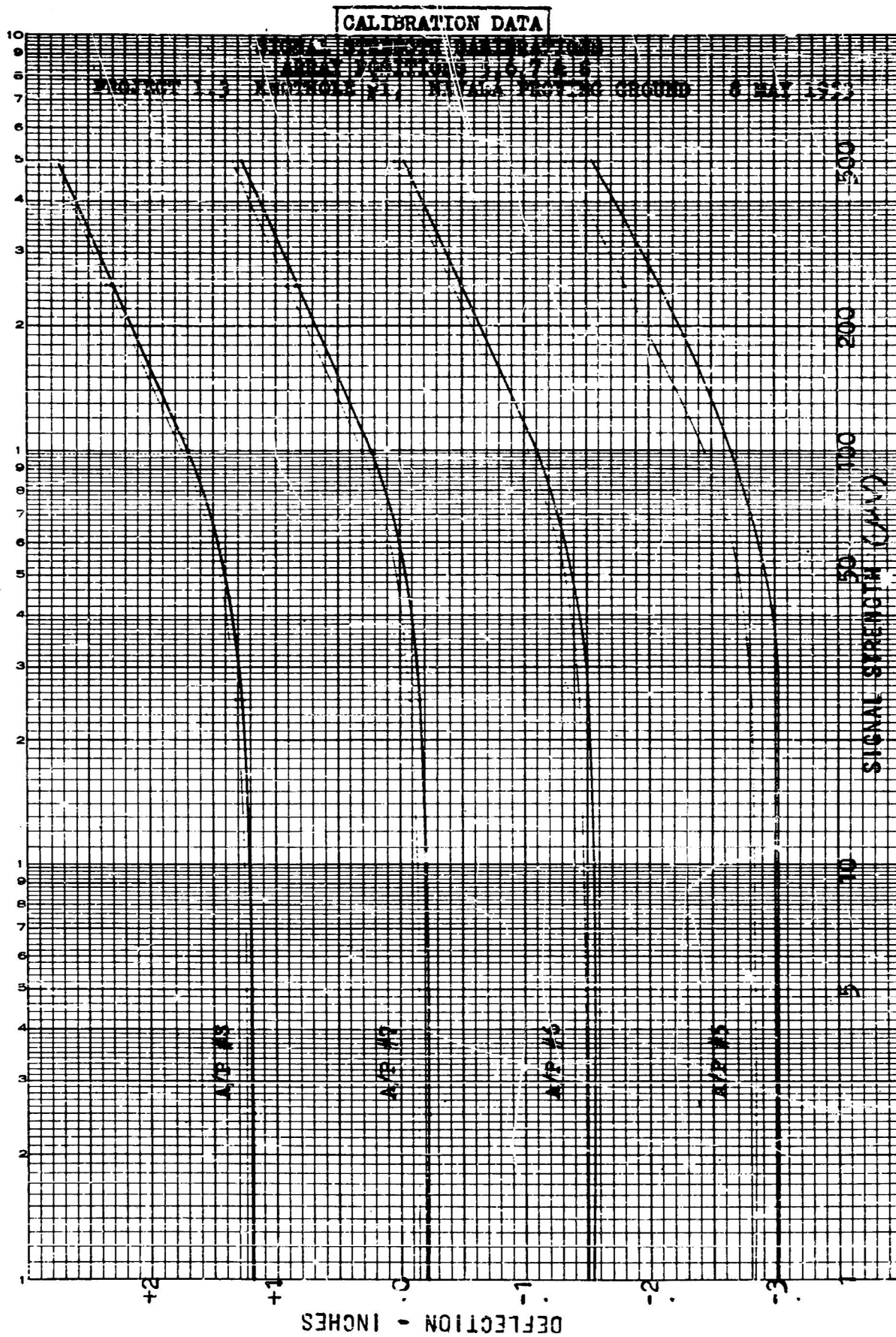


Figure 108

SECRET
SECURITY INFORMATION

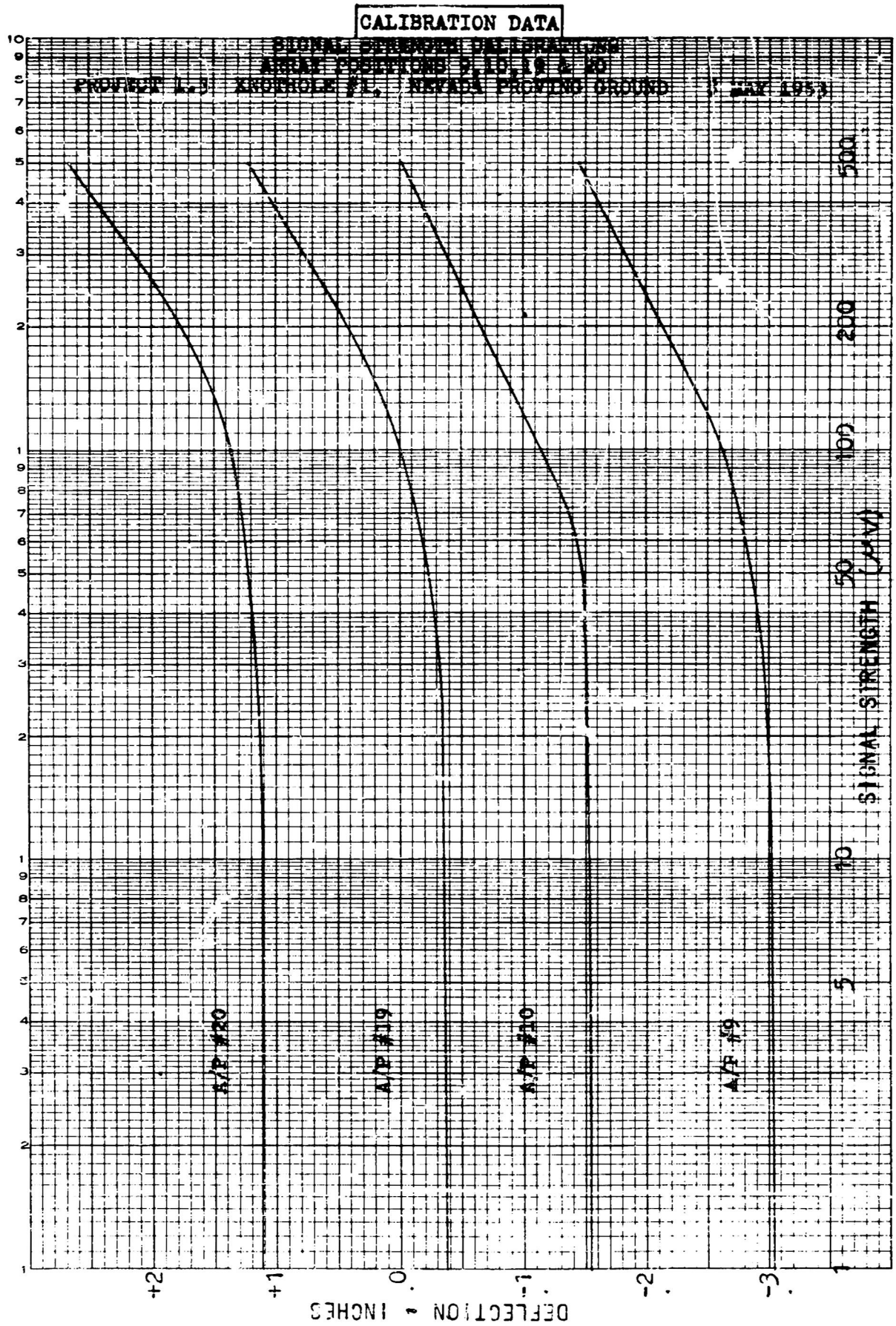


Figure 109

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SECURITY INFORMATION

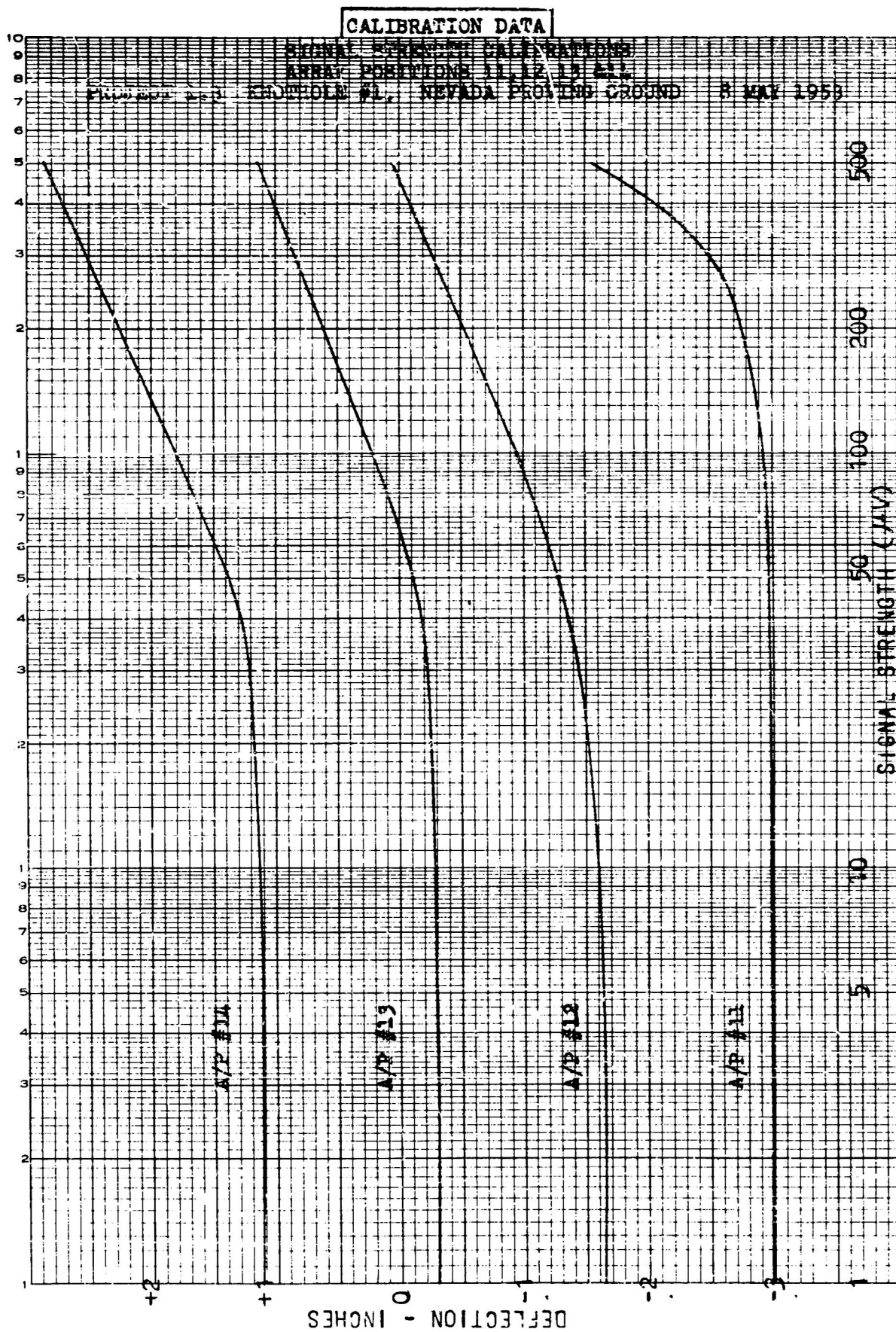


Figure 110

SECURITY INFORMATION

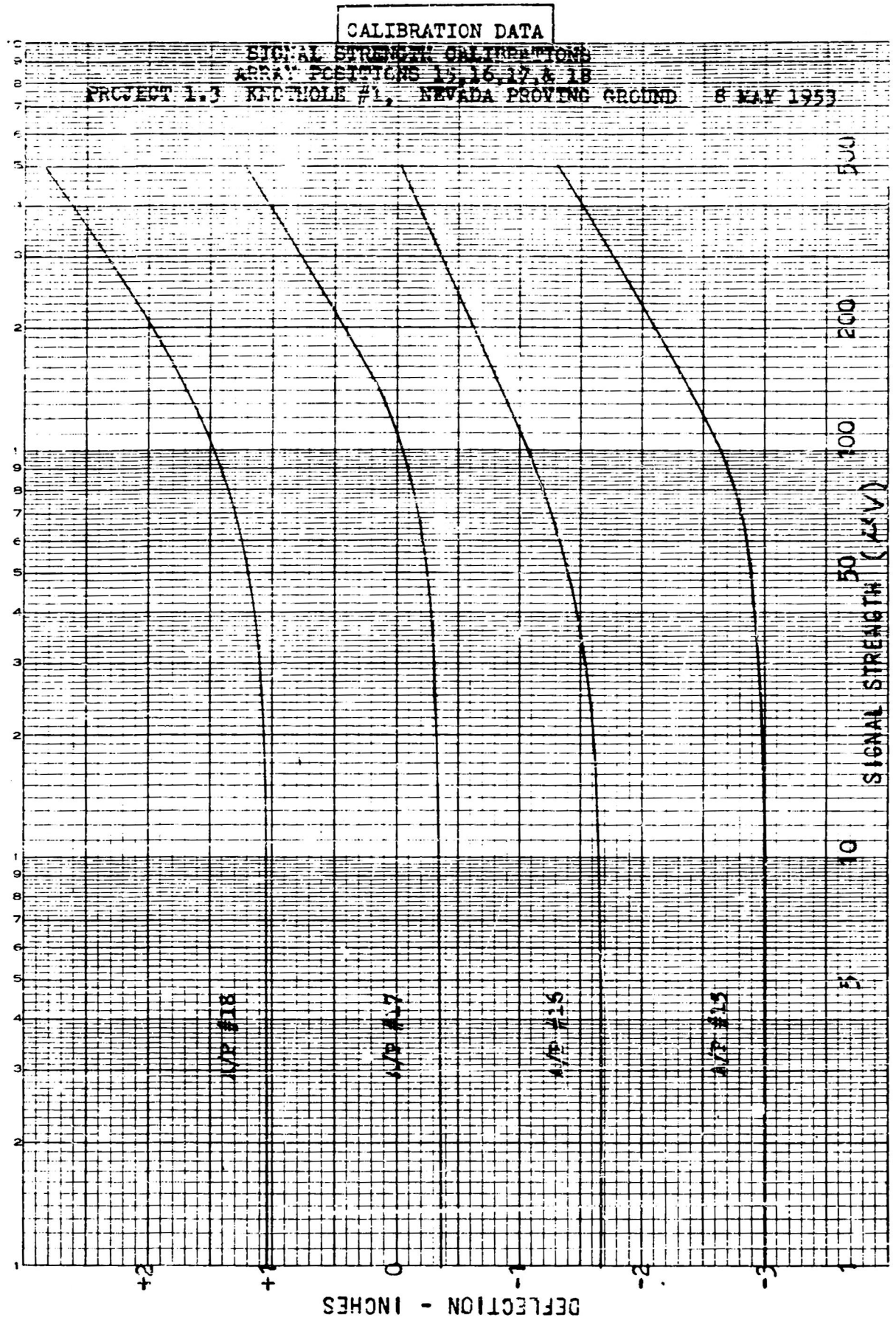


Figure 111

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